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REVUE SUISSE DE ZOOLOGIE, 104 (1): 3-11; mars 1997

A new species of *Brevitalitrus* (Crustacea, Amphipoda, Talitridae) from Mauritius – first record of the genus from the Indian Ocean

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A new species of *Brevitalitrus* (Crustacea, Amphipoda, Talitridae) from Mauritius – first record of the genus from the Indian Ocean. - A new species of landhopper (Amphipoda, Talitridae), *Brevitalitrus strinatii* n. sp., is described from a lava cave on the island of Mauritius (Indian Ocean). It has been compared with paratypes of *B. hortulanus* (Calman), the type-species of the genus *Brevitalitrus*, and with Transvaal topotypes of *Talitriator eastwoodae* Methuen, the type-species of the genus *Talitriator*. On the basis of this comparison, the new species is placed in *Brevitalitrus* rather than in *Talitriator*, and *Brevitalitrus* is removed from the simplidactylate to the cuspidactylate Talitridae. The new species is the first representative of *Brevitalitrus* recorded from an Indian Ocean island.

Key-words: Amphipoda - *Brevitalitrus* - *Talitriator* - Mauritius - cavernicole.

INTRODUCTION

Terrestrial Amphipoda are rarely recorded from islands in the Indian Ocean. The only pertinent Mauritius paper that I could trace is that of K.H. BARNARD (1936), who records *Talitrus (?) gulliveri* Miers, 1876 (now in *Talitriator*, *fide* Hurley, 1975: 166), *Talitroides topitotum* (Burt, 1934), and *Orchestia mauritiensis* K.H. Barnard, 1936. The first of these, *T. gulliveri*, was not described by BARNARD from Mauritius proper, but based on two cotypes loaned from the British Museum (Natural History), London, originating from the island of Rodriguez, like Mauritius is the Mascarene group, but some 1200 km more to the east. The second species, *T. topitotum*, may originate from S.E. Asia, but has synanthropically been introduced in warmer countries all over the world. The third species, *O. mauritiensis*, certainly does not belong in the genus *Orchestia*, but is hard to place correctly, since it was not illustrated in great detail by Barnard. *Macarorchestia* or *Floresorchestia* might be a possible seat for *mauritiensis*.

Manuscript accepted 22.04.1996

Dr P. Strinati kindly entrusted me another terrestrial amphipod collected recently in a cave on Mauritius, an island in the Indian Ocean (ca. 20°10' S 57°30' E), some 2500 km E of the African mainland.

Although obtained in a cave, the animal shows few cave adaptations: some of the ocelli are depigmented and the antennae are somewhat more slender than in epigean talitrids. I would not be surprised if it were found again in humid forest bottoms.

THE MAURITIUS TALITRID

The present Mauritius landhopper does not belong to any of the taxa recorded by K.H. Barnard from the island. It is close to the genera *Talitriator* Methuen, 1913 (see STOCK & BIERNBAUM 1994, for review of the component species) and *Brevitalitrus* Bousfield, 1971 (with review of the species included). Unfortunately, the subtle differences between these two genera (BOUSFIELD 1971: 284) are not borne out by all component species or are not described or illustrated for certain others.

So, the marginally spinous exopodite of uropods 1 and 2, attributed to *Brevitalitrus*, fails to discriminate *B. toli* (J.L. Barnard, 1960), *B. hortulanus* (*sensu* J.L. Barnard, 1960), *B. dyaulanus* Bousfield, 1971, and *B. nesius* (J.L. Barnard, 1960), which all have a glabrous ramus. The propodus of gnathopod 1 is said to be "deep" in *Talitriator*, but it is not in *T. insularis* Stock & Biernbaum, 1994 and *T. cylindripes* K.H. Barnard, 1940. The ischium of gnathopod 2 is of about the same elongate shape, in species of *Brevitalitrus* and *Talitriator*, not really distinguishing the two genera. The telson of *Brevitalitrus* usually has one large spine on each lobe, that of *Talitriator* has 2 or 3 large spines, but in a series of paratypes of the type-species of *Brevitalitrus*, *B. hortulanus* (Calman, 1912), which I re-examined for the purpose of this study, five had one spine, whereas two had two spines, showing that this character is not absolutely discriminative.

Both genera, *Talitriator* and *Brevitalitrus*, were classified with the simplidactylate landhoppers by BOUSFIELD (1984, Table 7), and I tended therefore to synonymize the two. However, to my surprise, I found that the seven paratypes of the generotype *B. hortulanus* were all cuspidactylate, whereas the generotype of *Talitriator*, *T. eastwoodae* Methuen, 1913 showed simplidactylate pereiopods. Close inspection of drawings of various other *Brevitalitrus* species described by J.L. BARNARD (1960), with a magnifying glass, revealed cuspidactylate pereiopods in *B. toli* (his fig. 2f, g, i) and in what he considers *B. hortulanus* (his fig. 1g). Although BOUSFIELD (1971: 285, fig. 17) re-examined all original material on which CALMAN initially described *B. hortulanus*, he failed to notice this important character.

The Mauritius material is cuspidactylate and has moreover unequal rami of uropod 2, agreeing in both characters better with *Brevitalitrus* than with *Talitriator*. Within *Brevitalitrus* it is in many details very similar to the paratypes of *B. hortulanus*. The distinction between the various taxa within this genus is of a very refined nature (see for instance BOUSFIELD's key, 1971: 285).

It should be noted here that BOUSFIELD's key is misleading in couplet 3, that attributes a long peduncular segment 3 in antenna 1 ("nearly equal to segments 1 and 2 combined") to *B. hortulanus*, whereas the paratypes re-examined by me, and BOUSFIELD's own fig. 17–A1, show a relatively short third peduncular segment, about 15% longer than segment 2. An unnamed "variety" from the New Hebrides has a long peduncular segment 3, according to BOUSFIELD's re-examination (1971: 287) of STEPHENSEN's (1943; 299, fig. 2) original sample in the Zoological Museum Copenhagen.

DESCRIPTION OF **Brevitalitrus strinatii** n. sp.

Material. - 1 ♂ (holotype), completely dissected and mounted on 2 slides in Reyne's modification of Faure's medium. Mauritius, Trois Cavernes, 6 Nov. 1994, leg. P. Strinati. Deposited in the Muséum d'histoire naturelle, Geneva.

The cave called 'Trois Cavernes' is located near Cascavelle (W. of Quatre Bornes and S. of Bambous, just E. of road A3). It extends over 240 m, of which 194 m form a cavity, in lava outcrops of Trou aux Cerfs. The cave consists, as the name suggests, in reality of 3 cavities. The talitrid was found in the third cavity, which is rather humid with a bottom covered with small stones and woody debris. At the collection site it is completely dark, air temperature 22° C. A more detailed description of the cave can be found in BILLON & CHOJNACKI (1993)

MALE (holotype): Body length 7.3 mm. Body surface unarmed. Eye (fig. 1a) roughly egg-shaped, black, but some ocelli lacking pigmentation.

First antenna (fig. 1a) twice as long as length of head; peduncular segment 3 only slightly longer than segment 2; flagellum 8-segmented, segments 3 through 7 with 1 (rarely 2) short, pawn-shaped aesthetascs (marked by * in fig. 1a).

Second antenna (fig. 1a) with slender, 22-segmented flagellum, geniculate at first segment, as in *Talitriator*. First antenna reaching to distal end of peduncle segment 5 of second antenna.

Upper and lower lips, and mandible comparable to those of *Talitriator insularis* Stock & Biernbaum, 1994. First maxilla with 10 (not 9) distal spines on outer lobe; from outer to inner, these spines bear 0–0–2–5–3–1–4–3–3–3 (left) or 0–0–0–4–4–1–3–3–3–3 denticles (right), respectively; palp small, without distal setules. Second maxilla (fig. 1b) with long proximo-medial seta on the inner lobe, displaced to the proximal part of the lobe. Maxilliped (fig. 1c) with articulate 4th palp segment.

First gnathopod (fig. 2a): posterior margin of carpus convex; propodus tapering, not 'deep'; palm not demarcated; unguis slightly shorter than dactylus.

Second gnathopod (fig. 2b): propodus slender, distal lobe rounded, not upcurved.

Third pereiopod (fig. 2c): unguis and dactylus of equal length; dactylus not 'pinched'. Fourth pereiopod (fig. 2d): projecting posterior point of coxal plate small; dactylus 'pinched'. Fifth and sixth pereiopod as illustrated (fig. 2f, g); basis of P5 with free posterior lobe. Seventh pereiopod (fig. 2h) with subcircular basis; distoposterior

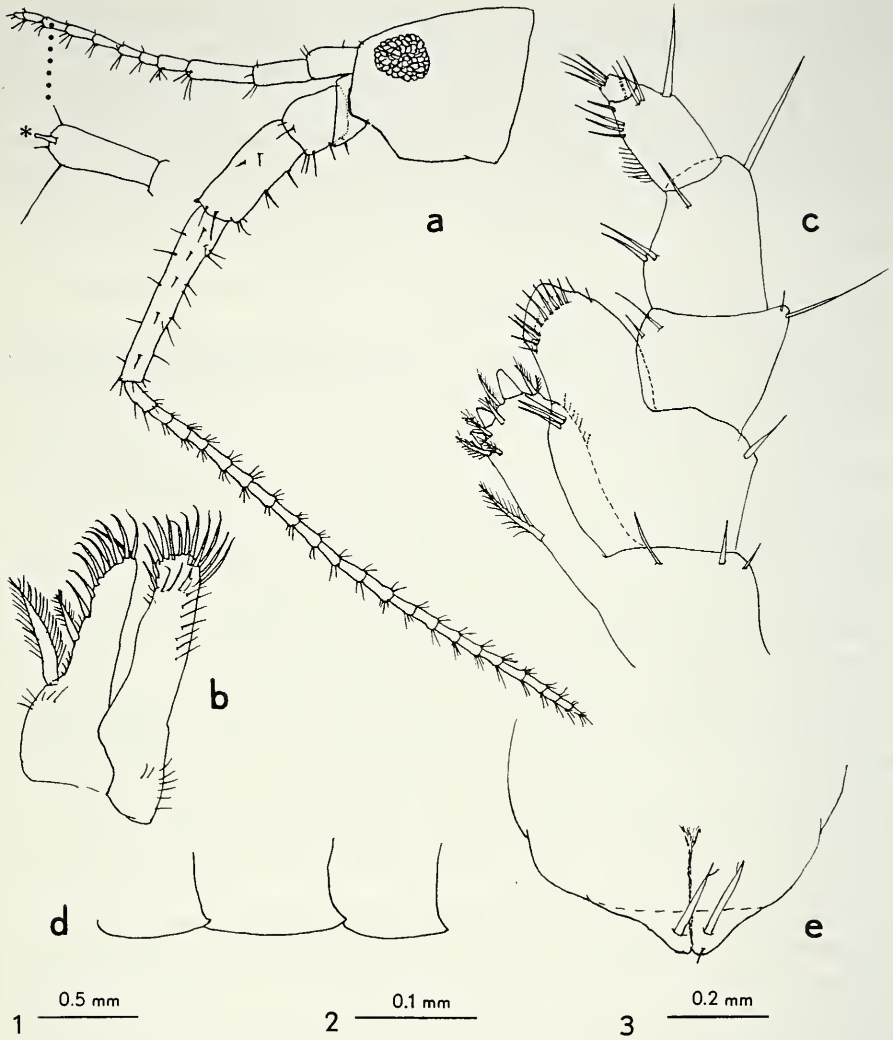

FIG. 1

Brevitalitrus strinatii n. sp., ♂ holotype. a, head and antennae, from the left (scale 1) (aesthetasc on flagellar segment 6 of antenna 1 more strongly enlarged); b, maxilla 2 (2); c, maxilliped (2); d, epimeral plates 1 to 3 (1); e, telson (2).

lobe free and shallowly incised near junction with ischium. All pereiopods cuspidactylate. Coxal gills on gnathopod 2 and pereiopods 3 through 6, relatively simple, not strongly branched or contorted, largest on gnathopod 2.

Epimeral plates (fig. 1d) unarmed, with slightly pointed posteroventral corner. First and second pleopods (fig. 3c, d) with slender, rod-like peduncle; peduncular margins smooth; rami 3-segmented (segmentation lines somewhat indistinct), with short plumose setae on outer and inner margins, and 2 long plumose setae on distal end. Third pleopod (fig. 3e) shortened, peduncle not slender, but with finely setulose inner and outer margins, outer margin moreover with 2 short plumose setae; rami less than half as long as peduncle, unsegmented, with several plumose setae. All pleopods with 2 (medial) retinacula, of bifid shape (fig. 3d, detail).

First uropod (fig. 3f): peduncle with 6 spines on outer dorsal margin, 3 spines on inner dorsal margin and with short interramal spine (about 25% of length of exopodite); 3 spines on dorsal margin of each ramus. Second uropod (fig. 3g) likewise with some spines on dorsal margin of rami; exopodite distinctly shorter than endopodite. Third uropod (fig. 3h): peduncle with 1 large outer spine; 2 very unequal distal spines on ramus.

Telson (fig. 1e) with shallow distal incision; each lobe with 1 distodorsal spine.

Derivatio nominis. - Named in honour of Dr Pierre Strinati, well-known Swiss biospeologist, who collected the talitrid described above.

Remarks. - The Mauritius specimen agrees in most characters with the paratypes of *Brevitalitrus hortulanus*. I have not dissected the paratypes, so for the finer structure of the mouthparts, I have relied upon BOUSFIELD's (1971) drawings of a dissected paratype. The third peduncular segment of antenna 1 agrees with the *B. hortulanus* types, in that it is only slightly longer than segment 2. Similar peduncular lengths are observed in *B. hortulanus* (*sensu* J.L. Barnard, 1960), possibly based on young material, and presumably in *B. stephenseni* Bousfield, 1971 (first antenna neither described nor illustrated, but said to "agree on the whole" with CALMAN's description). *B. stephenseni* is more *Talitriator*-like than any other taxon in the genus, since the telson bears not just one but several spines. Moreover, *B. stephenseni* is distinguished by a prominent rounded tooth on the ventroposterior corner of each epimeral plate. The relative length of the peduncular segments is also approached by *B. wolffi* Bousfield, 1971, but this species differs from *B. hortulanus* and *B. strinatii* by the absence of an incision between the posterodistal lobe of the basis of leg 7 at the junction with the ischium, less spinose pedunculi and rami of uropods 1 and 2, a non-lobate basis of pereiopod 5, an unmodified (not 'pinched') dactylus of pereiopod 4, segmented rami on uropod 3, a longer interramal spine on uropod 1, and the presence of plumose setae on the *inner* margin of the pedunculus of pleopods 2 and 3 (on *outer* margin of pleopod 3 only in *strinatii*).

From all other taxa recognized in *Brevitalitrus*, the new species from Mauritius differs in the relatively short third peduncular segment of the first antenna (all others: segment 3 almost as long as segments 1 and 2 combined), and in having dorsal spines on the exopodite of uropods 1 and 2 (all others: naked dorsal margin).

Yet, I cannot positively identify the Mauritius material with *B. hortulanus*, because of a number of differences, delicate but of the same magnitude as used by BOUSFIELD (1971) to distinguish the other 7 (named or unnamed) taxa in the genus: (1) the basis of pereiopod 5 shows a deep distomedial sinus in *strinatii* (fig. 3b, arrow), a shallow sinus in *hortulanus* (fig. 3a, arrow); (2) the inner seta on the inner lobe of maxilla 2 is much stronger and displaced in proximal direction in *strinatii*

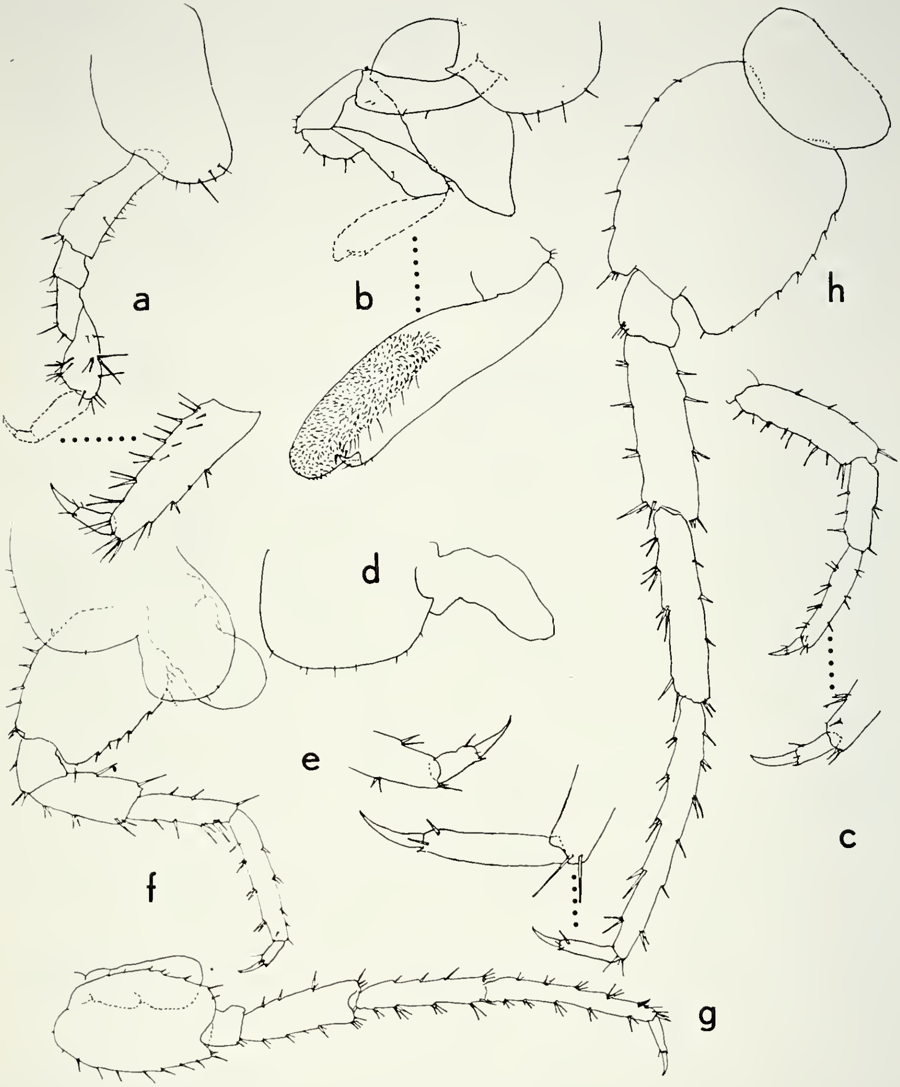

FIG. 2

Brevitalitrus strinatii n. sp., ♂ holotype. a, gnathopod 1; b, gnathopod 2; c, pereiopod 3; d, coxal plate and gill of pereiopod 4; e, claw of pereiopod 4; f, pereiopod 5; g, pereiopod 6; h, pereiopod 7. All to scale 1 (scale on fig. 1).

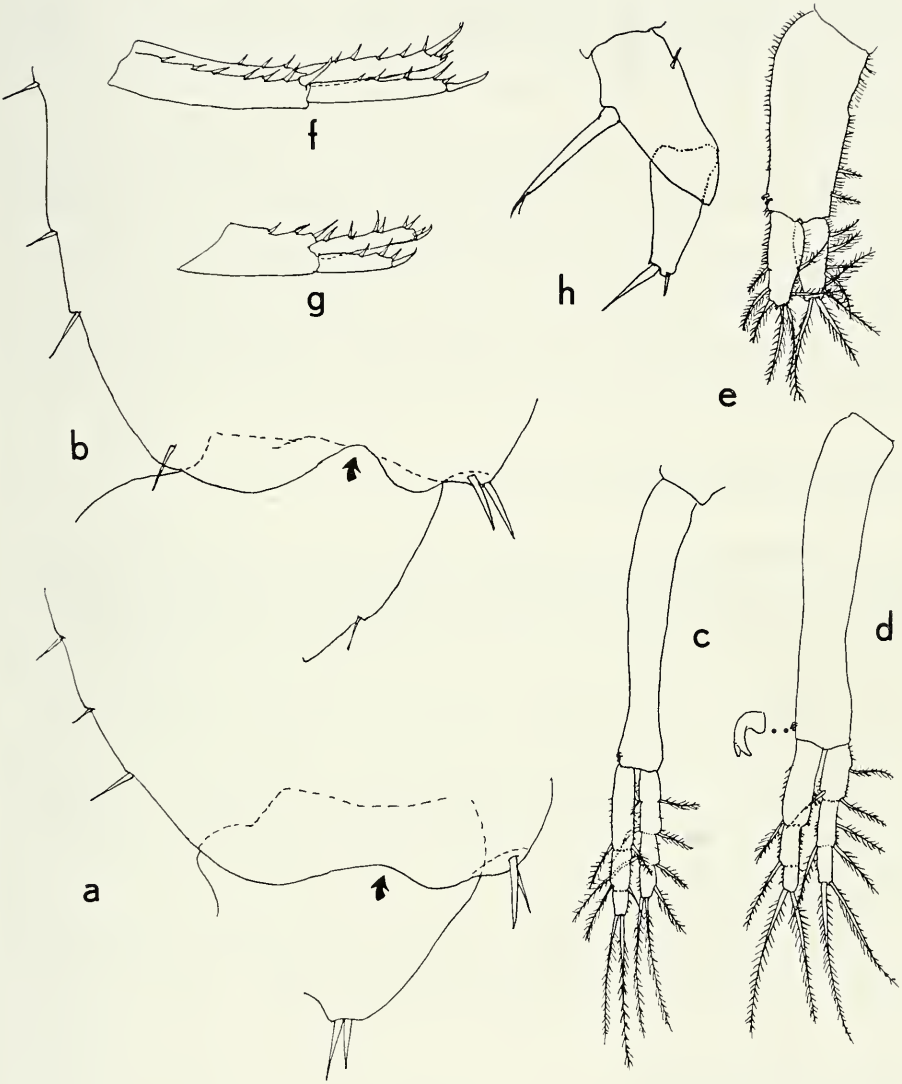

FIG. 3

a: *Brevitalitrus hortulanus* (Calman, 1912), paratype, BM(NH) 1912:1:6:1–9; b–h: *Brevitalitrus strinatii* n. sp., ♂ holotype. a, distal part of basis of pereiopod 5 (scale 3); b, same of the other species (3); c, pleopod 1 (3); d, pleopod 2 (3); e, pleopod 3 (3); f, uropod 1 (1); g, uropod 2 (1); h, uropod 3 (2). Scales on fig. 1.

(compare our fig. 1b with Bousfield's, 1971, fig. 17); (3) segment 4 of the maxillipedal palp is free in *strinatii*, fused with segment 3 in *hortulanus*; (4) the shape of uropod 3 is different (cf. fig. 3h in present paper with fig. 17–U3 in Bousfield 1971); (5) the eye of *strinatii* is larger than in *hortulanus*; (6) the rami of pleopods 1 and 2 are about half as long as the pedunculus in *strinatii*, nearly as long as the pedunculus in *hortulanus*.

From "*Talitrus*" (a *Talitriator?*) *gulliveri*, recorded from Rodriguez in the Mascarene archipelago, to which Mauritius also belongs, *Brevitalitrus strinatii* differs in a number of characters, as far as we can judge in absence of any published illustrations of *gulliveri*, viz. the rami of the pleopods (as long as pedunculus in *gulliveri*, versus half as long in *strinatii*); (2) the propodus of gnathopod 1 ($^2/_3$ as long as the carpus in *gulliveri*, equally long in *strinatii*); (3) maxilla 1 (without trace of palp in *gulliveri*, short palp present in *strinatii*); (4) pleopod 3 (not reduced, almost as long as pleopod 2 and with segmented rami, in *gulliveri*, against the reduced size and segmentation in *striuatii*).

BIOGEOGRAPHIC OBSERVATIONS

The whereabouts of the type-species of *Brevitalitrus*, *B. hortulanus*, remain uncertain. Calman based his description on material from Kew Gardens (England), but on later inspection (Bousfield 1971: 287) his material proved to consist of a mixture of two species: the real *B. hortulanus* and *Talitroides topitotum* (Burt, 1934). Later, *B. hortulanus* was recorded on two occasions from nature (J.L. Barnard 1960: 17; Stephensen 1943: 296) but these records are questioned by Bousfield (1971), who revisited Stephensen's material and considered it distinct from the types of *B. hortulanus*. Barnard's material, because of its small size possibly juvenile, is also considered different, since it lacks armature on the dorsal margin of the exopodite of uropod 1. If these questionable records represent just 'variants' of *B. hortulanus*, the true home for this species would be the New Hebrides, and the islands of Ton, Truk and Palau in the S.E. Pacific Ocean.

Other species of *Brevitalitrus* have been described from the Caroline islands, Samoa, Mussau I., and Dyaul I., all in the S.E. Pacific as well. The present finding in Mauritius is the first record from an island in the Indian Ocean.

ACKNOWLEDGEMENTS

I am indebted to Dr P. Strinati (Cologny, Switzerland) for entrusting me the Mauritius talitrid; Professor Ch. Griffiths (Rondebosch, South Africa) for putting some specimens of *Talitriator eastwoodae* at my disposal; and Dr R. Lincoln (The Natural History Museum, London) for making the paratypes of *Brevitalitrus hortulanus* available for comparison.

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REVUE SUISSE DE ZOOLOGIE 104 (1): 13-16; mars 1996

Systématique évolutive des *Pseudosinella*. XV. Une espèce nouvelle provenant des Iles Canaries (Insecta: Collembola).

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3000 Coimbra Codex, Portugal.

Evolutionary systematics of *Pseudosinella*. XV. One new species from Canary Islands (Insecta: Collembola). - This paper contains the description of one new species of the genus *Pseudosinella* from Canaries (Islands of Tenerife and Fuerteventura) collected in volcanic caves.

Key-words: Insecta - Collembola - *Pseudosinella* - new species.

INTRODUCTION

Les matériaux qui concernent cette espèce ont été récoltés dans quatre grottes volcaniques des Iles Canaries: Cueva del Llano, la seule grotte existante dans l'Ile de Fuerteventura, et Cueva del Bucio, Cueva de Felipe Reventón et Cueva del Viento situées dans l'Ile Tenerife.

L'étude de *Pseudosinella oromii* n. sp. et d'autres espèces de Collemboles récoltés dans la Cueva del Viento s'insère dans un projet d'impact environnemental, qui est en train d'être réalisé dans cette grotte, sous l'orientation du Professeur Pedro Oromí, du Département de Zoologie de l'Université de la Laguna, Tenerife.

Je remercie le Professeur Oromí de m'avoir confié l'étude de ces matériaux.

Les types de la nouvelle espèce sont déposés au Muséum d'histoire naturelle de Genève (MHNG), au Département de Zoologie de l'Université de La Laguna (U.L.) et au Musée de Zoologie de l' Université de Coimbra (M.C.).

Pseudosinella oromii n. sp.

STATIONS ET TYPES*:

Canaries, Tenerife, Icod de los Vinos, 650 m altitude, Cueva del Sobrado (Cueva del Viento): holotype et 1 paratype (prép.), leg. M. Arechavaleta, V. 1994 (Mr3-Q) (MHNG). Idem, 2 paratypes (alcool), leg. P. Oromí, V. 1994 (Mr1-B-ol) (U.L.). Idem, 1 paratype (alcool), leg. L. Sala, V. 1994 (S15-V-ol) (M.C.). Idem, 2 paratypes (alcool), leg. L. Sala, V. 1994 (S13-V3-ol) (M.C.). Idem, 1 paratype (alcool), leg. L. Sala, V. 1994 (S15-B2-ol) (MHNG).

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* La plupart du matériel est mal conservé.

Manuscrit accepté le 12.01.1996

Galería Intuición de la Cueva del Sobrado (Cueva del Viento), 26 paratypes, leg. L. Sala, V. 1994 (INT4-V). 6 paratypes, (prép.) (M.C.), 20 paratypes (alcool) (U.L.). Idem, 43 paratypes (alcool), leg. P. Oromí, V. 1994 (INT10-V-ol) (MHNG). Idem, 2 paratypes (alcool), leg. L. Sala, V. 1994 (INT13-V) (U.L.). Idem, 20 paratypes (alcool), leg. M. Arechavaleta, V. 1994 (INT16-V-ol) (U. L.). Idem, 6 paratypes (prép.), leg. L. Sala, V. 1994 (INT19-H) (MHNG). Idem, 3 paratypes (alcool), leg. M. Arechavaleta, V. 1994 (INT-V-7) (MHNG).

Galería de los Ingleses (Cueva del Viento), 4 paratypes (alcool), leg. M. Arechavaleta, V. 1994 (I2-V-ol) (MHNG). Idem, 4 paratypes (prép.), leg. L. Sala, V. 1994 (I10-V-ol) (U. L.). Idem, 4 paratypes (alcool), leg. M. Arechavaleta, V. 1994 (I14-V-ol) (U. L.). Idem, 8 paratypes (prép.), leg. M. Arechavaleta, V. 1994 (I14-B-ol) (M.C.).

Conexión entre la Galería de los Ingleses y la Galería principal de la Cueva del Viento, 10 paratypes (alcool), leg. M. Arechavaleta, V. 1994 (ING2-C) (M. C.).

Cueva del Viento, 5 paratypes (alcool), leg. L. Sala, V. 1994 (Vi-I-3) (MHNG).

Galería de la Cruz (Cueva del Viento), 3 paratypes (alcool), leg. P. Oromí, V. 1994 (C2-V3-ol) (U.L.).

Cueva del Viento (Conexión con la Cueva del Sobrado), 3 paratypes (prép.), leg. M. Arechavaleta, V. 1994 (S-Vi-B3-ol)) (MHNG). Idem, 2 paratypes (alcool), leg. L. Sala, V. 1994 (S-Vi-V3-ol) (M.C.). Idem, 4 paratypes (alcool), leg. P. Oromí, V. 1994 (S-Vi-V2-ol) (M. C.). Idem, 1 paratype (alcool), leg. M. Arechavaleta, V. 1994 (S-Vi-V1-ol) (U.L.).

Tenerife, Cueva de Felipe Reventón, 1 paratype (alcool), leg. P. Oromí, V. 1994 (F7-2-ol) (MHNG). Idem, 1 paratype (alcool), leg. L. Sala, V. 1994 (F7-5-ol) (U. L.).

Tenerife, Aguamansa, 1000 m altitude, Cueva del Bucio, 2 paratypes (prép.), leg. P. Oromí, 14. XII. 1990 (T. Bu. 6) (MHNG). Idem, 11 paratypes (prép.), leg. P. Oromí, 1. IV. 1991 (T. Bu. 22), 7 paratypes (U. L.) et 4 paratypes (M.C.).

Fuerteventura, Villaverde, 100 m altitude, Cueva del Llano, 2 paratypes (prép.), leg. P. Oromí, 14. II. 1991 (F. U. 24) (U.L.).

DESCRIPTION:

Taille: 1,6-2 mm. Pigment et yeux absents. Antennes / diagonale céphalique = 2. L'organe antennaire III présente la structure habituelle. Articles antennaires sans écailles. Macrochètes dorsaux: R001/10/0101+2. Le macrochète céphalique dorso-latéral est accompagné d'une trichobothrie. La disposition des macrochètes de l'abd. IV est répresentée dans la figure 1: les deux macrochètes médiaux sont placés derrière le pseudopore, étant le postérieur plus petit que l'antérieur. Chétotaxie de l'abd. II: - a B q_1q_2. Base du labium m_1 - r e l_1 l_2; la soie m_2 fait défaut, les grandes soies sont lisses et r est rudimentaire. Soie accessoire s de l'abd. IV absente. Griffe III (fig. 2) avec la dent impaire située à 50-60% de sa crête interne. Cette dent est parfois absente, surtout dans les griffes I et II, qui sont un peu plus élancées que la griffe III. Les dents proximales sont subégales et naissent sensiblement au même niveau. Le bord interne de l'empodium est droit dans sa moitié distale et il y a souvent une petite dent externe principalement dans les pattes I et II. Ergot tibiotarsal relativement allongé et faiblement épaissi à l'extrémité. La dent apicale du mucron est un peu plus longue que l` anteapicale.

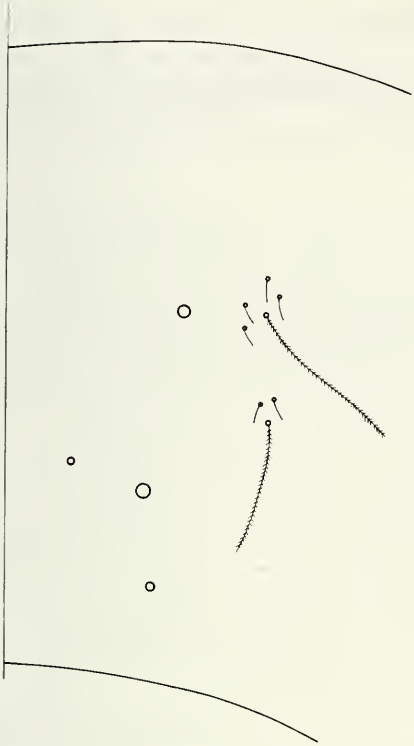

FIG. 1

Pseudosinella oromii n. sp.
Chétotaxie de l'abd. IV.

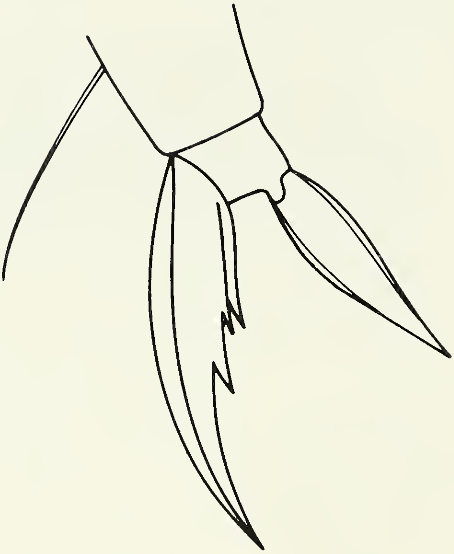

FIG. 2

Pseudosinella oromii n. sp.
Griffe III, face postérieure.

DISCUSSION:

Il est très difficile et problématique d'établir des rapports phylogénétiques entre *P. oromii* n. sp. et les autres espèces de ce genre appartenant à la lignée généalogique dérivée de *Lepidocyrtus pallidus* Reuter, 1890 emend. Gisin, 1965 (GISIN 1967; GAMA 1984). En effet, cette nouvelle espèce présente des caractères particuliers et une corrélation de caractères qu'on ne trouve pas ailleurs: sur la base du labium m_2 fait défaut, mais les autres soies sont lisses, tandis que les espèces, chez lesquelles cette soie est absente, ont les soies M_1, E, L_1 et L_2 ciliées. Il s'agit d'espèces primitives, dont la plupart possèdent des yeux et des antennes courtes. *P. oromii* n. sp., par contre, est aveugle et ses antennes sont relativement allongées.

Les caractères mentionnés et la forme de l'empodium (fig.2), dont le bord interne est droit dans sa moitié distale, sont des caractères évolués, qui révèlent dèja une certaine adaptation à la vie cavernicole.

Il faut également faire ressortir la disposition des macrochètes médiaux de l'abd. IV par rapport au pseudopore (fig. 1). *P. infrequens* présente aussi cette particularité, mais la plupart de ses caractères ne sont pas partagés par *P. oromii* n. sp. (GISIN & GAMA 1969: 145).

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Aleocharinae della Colombia e dell'Ecuador: Parte III (conclusione) (Coleoptera, Staphylinidae)

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Aleocharinae from Colombia and Ecuador: Part III (conclusion) (Coleoptera, Staphylinidae). - This paper adds further new species to our knowledge of the Neotropical region. One new species belongs to the tribe Athetini, twenty to the tribe Myrmedoniini, five to the tribe Oxypodini, one to the tribe Hoplandriini and two to the tribe Aleocharini. The new genus *Parabainusa* of the tribe Oxypodini, the new genus *Eydelusa* of the tribe Aleocharini and the new subgenus *Apatusa* of the genus *Thiasophila* Kraatz, are described and illustrated. *Brachida importuna* Erichson is transferred to the genus *Orphnebius* Motschulsky.

Key-words: Coleoptera - Staphylinidae - Aleocharinae - Taxonomy - Colombia - Ecuador.

INTRODUZIONE

Con il presente lavoro si conclude la pubblicazione delle Aleocharinae della Colombia raccolte dal Dr Hans Georg Müller dell'Università di Giessen e dell'Ecuador raccolte dal Prof. Herbert Franz di Mödling e dal Dr Luca Bartolozzi del Museo Zoologico de "La Specola" dell'Università di Firenze. A questo materiale è aggiunto un piccolo lotto di Aleocharinae della Colombia facente parte di vecchie collezioni del Museo Zoologico dell'Università Humboldt di Berlino, affidatomi in studio dal Dr Manfred Uhlig di detto Museo.

La prima parte di questa serie è stata pubblicata sulla Revue suisse de Zoologie nell'anno 1996 come la seconda.

Gli holotypi delle nuove specie sono conservati nel "Muséum d'Histoire Naturelle" di Ginevra (MG), nello "Zoologisches Museum" dell'Università Humboldt di Berlino (MB), in collezione Franz (CFR) e nel Museo Zoologico de "La Specola" dell'Università di Firenze (MF). Paratipi di alcune specie sono conservati anche nel Museo di Zoologia della "Pontificia Università Catòlica del Ecuador" di Quito (MQ).

(133° Contributo alla conoscenza delle Aleocharinae)

Manoscritto accettato il 12.10.1995.

DESCRIZIONI

ATHETINI

Leptonia colombica sp. n. (Figg. 1–3)

TIPI. Holotypus ♂, Bogotà, (MB).
Paratypi: 3 ♀♀, stessa provenienza.

Descrizione. Lunghezza 3,5 mm. Corpo lucido e bruno; addome bruno rossiccio con quarto urite libero bruno; antenne brunicce con antennomeri basali 1° a 6° gialli: il passaggio dal giallo al bruno è sfumato; zampe bruno-rossicce con tarsi giallo-rossicci. La reticolazione del capo è distinta, quella del pronoto è quasi indistinta e quella delle elitre e dell'addome è assente. Il capo presenta punteggiatura svanita e una profonda fossetta discale, nel fondo della quale la reticolazione è a maglie grandi e nette. I tubercoletti del pronoto sono quasi indistinti, quelli delle elitre sono fini e molto svaniti. Edeago figg. 2–3, spermateca a forma della lettera S, con bulbo distale poco sviluppato: all'interno di esso sta un'ampia e profonda introflessione apicale che occupa pressoché l'intero spazio interno.

Comparazioni. Specie ben distinta da *L. lunata* (Erischson, 1840) del Brasile per avere gli occhi lunghi quanto le tempie e non più lunghi come in *lunata* e per avere le elitre meno larghe, rispetto il pronoto. Inoltre differisce per avere l'edeago tozzo e di taglia nettamente inferiore (slanciato in *lunata*), per la presenza di una larga e profonda introflessione apicale del bulbo distale della spermateca (assente in *lunata*) e per la parte prossimale della spermateca stessa, descrivente una spira incompleta e non una spira e mezza come in *lunata*.

MYRMEDONIINI

Heterostiba cotopaxiensis sp. n. (Figg. 4–6)

TIPI. Holotypus ♂, Ecuador, Cotopaxi, 3500–4800 m, (H. Franz leg., CFR).
Paratypus: 1 ♂, stessa provenienza.

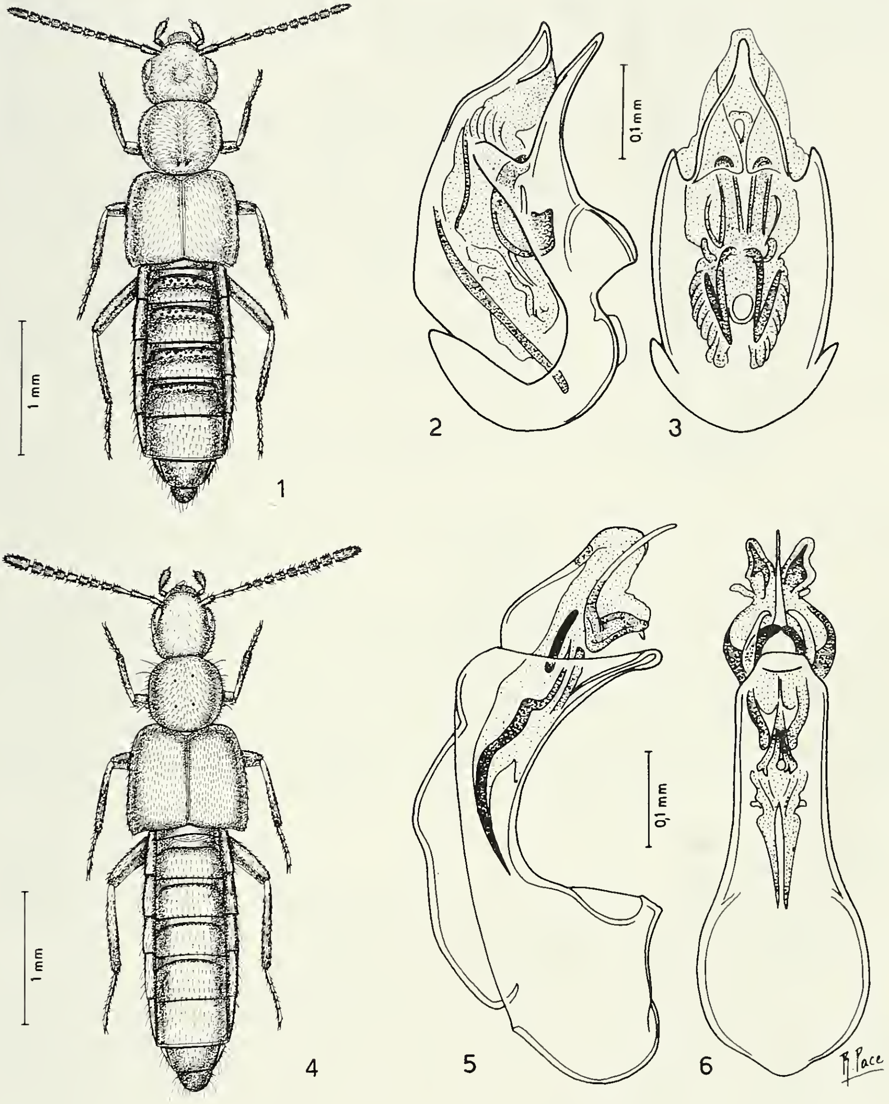
Descrizione. Lunghezza 3,9 mm. Corpo lucido e nero; elitre, margine posteriore degli uroterghi ed estremità addominale bruno-rossicci; antenne nere; zampe rossicce. La reticolazione del capo e dell'addome è distinta, a maglie trasverse sull'addome, quella del pronoto è assente e quella delle elitre è svanita. La punteggiatura del capo è svanita, quella delle elitre è distinta. Tubercoletti ben salienti coprono la superficie del pronoto. Edeago figg. 5–6.

Comparazioni. L'habitus della nuova specie è simile a quello di *H. quechua* Pace, 1986, del Perù, ma l'edeago della nuova specie è molto più profondamente ricurvo al lato ventrale e l'apice, in visione ventrale, è tronco e non acuto come in *quechua*.

Heterostiba uhligi sp. n. (Figg. 7–8)

TIPO. Holotypus ♀, Muzo (MB).

Descrizione. Lunghezza 2,7 mm. Corpo lucidissimo e bruno; antenne brune con l'antennomero basale giallo sporco; zampe bruno-rossicce con metà basale dei



FIGG. 1–6

Habitus ed edeago in visione laterale e ventrale. 1–3: *Leptonia colombica* sp. n.; 4–6: *Heterostiba cotopaxiensis* sp. n.

femori, le due estremità delle tibie e i tarsi giallo-rossicci. La reticolazione sull'avancorpo è assente, quella sull'addome è composta di maglie molto trasverse e distinte. La punteggiatura del capo è fine e quasi indistinta, quella del pronoto non è visibile e quella delle elitre è svanita. Spermateca fig. 8.

Comparazioni. La nuova specie è distinta da *H. quechua* Pace, 1986, del Perù, per avere il capo privo di reticolazione (capo nettamente reticolato in *quechua*) e per la matassa della spermateca meno sviluppata, con bulbo distale con sfera terminale e non con ricciolo terminale, come nel bulbo distale della spermateca di *quechua*.

Etimologia. Specie dedicata al Dr Manfred Uhlig del Museo Zoologico dell'Università Humboldt di Berlino, che me l'ha affidata in studio.

Dinusella aequinoctialis sp. n. (Figg. 9–12)

TIPI. Holotypus ♂, Ecuador, Umg. Guayaquil, Km 26 Strasse n. Daule, VII.1975, (H. Franz leg., CFR).

Paratypi: 9 es., stessa provenienza.

Descrizione. Lunghezza 2,1 mm. Corpo lucidissimo e giallo-rossiccio; antenne e zampe gialle. Sull'intero corpo è assente la reticolazione. La punteggiatura del capo è distinta. I tubercoletti della superficie del pronoto sono svaniti e quelli delle elitre sono distinti, ma poco salienti. Lungo la sutura le elitre sono depresse. Edeago figg. 10–11, spermateca fig. 12.

Comparazioni. La nuova specie è nettamente differente da *D. longicornis* Wasmann, 1893, del Brasile, per avere il pronoto meno trasverso, le elitre a lati paralleli e non divergenti all'indietro, come in *longicornis*, e per l'assenza di setole robuste ai lati del corpo (presenti in *longicornis*). L'edeago della nuova specie ha dimensioni enormi rispetto l'edeago di *longicornis*, che è simile a quello di alcune specie del genere *Atheta* Thomson, 1858. Inoltre, l'edeago della nuova specie possiede un flagello del sacco interno, assente nell'edeago di *longicornis*.

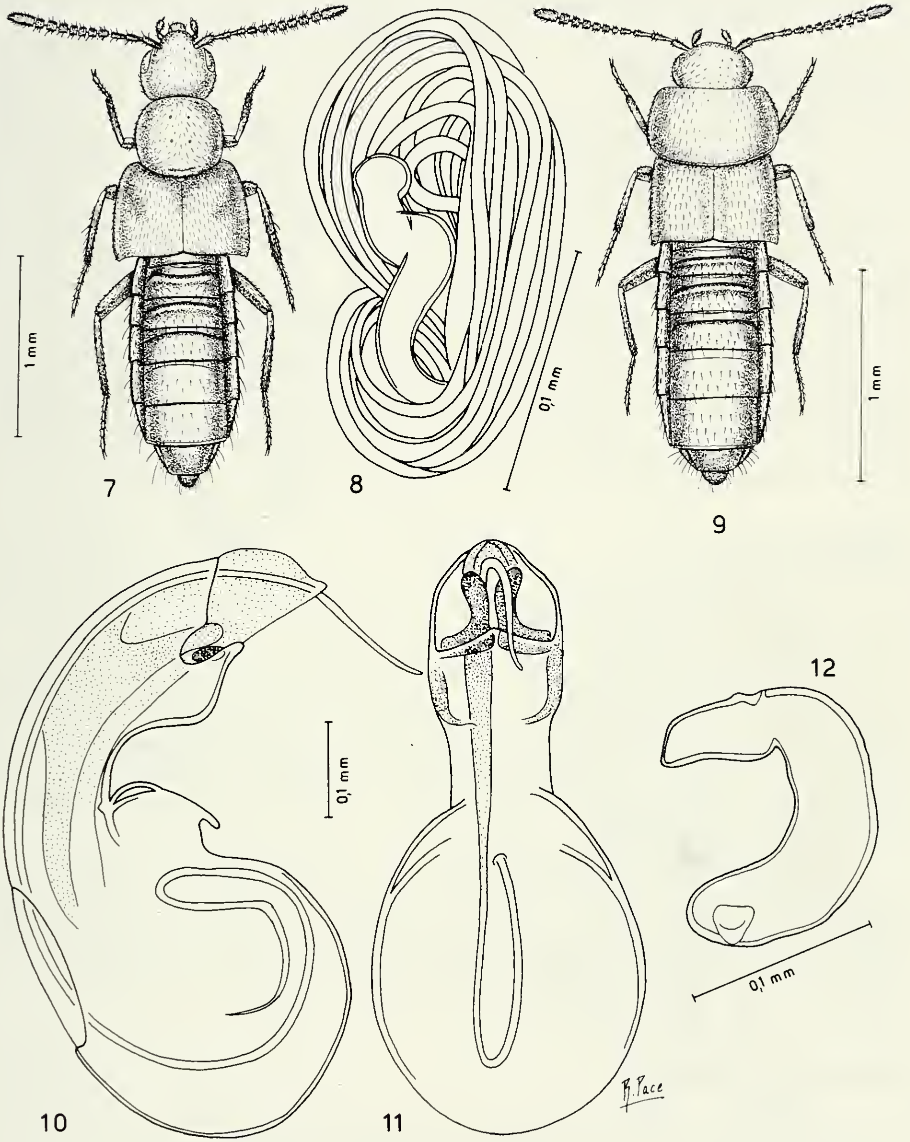
Apalonia chibcha sp. n. (Figg. 13–14)

TIPI. Holotypus ♀, Kolumbien, Villa Culebra bei Bonda, ca. 10 Km E Sta. Marta, XI–XII.1985, Barberfallen, (Müller leg., MG).

Paratypus: 1 ♀, stessa provenienza, ma in data X.1985.

Descrizione. Lunghezza 2,4 mm. Corpo lucidissimo e rossiccio; elitre e uriti terzo a sesto bruni; antenne brune con i tre antennomeri basali giallo-rossicci; zampe brune con tarsi giallo-rossicci. L'intero corpo è privo di reticolazione. I tubercoletti della superficie del capo sono svaniti, quelli del pronoto sono distinti e quelli delle elitre sono salienti. Spermateca fig. 14.

Comparazioni. Per la taglia corporea (2,4 mm), la nuova specie si avvicina ad *A. angustula* Casey, 1893, della Florida (lunghezza 2,3 mm), più che ad *A. seticornis* (Casey, 1906), pure della Florida, che ha taglia di 1,2 mm, oppure ad *A. confinis* (Sharp, 1883) e ad *A. setigera* (Sharp, 1883), entrambe del Guatemala, che hanno taglia maggiore di 3,0 mm. La nuova specie è differente da *A. angustula* Casey, 1893, per avere il lati del pronoto non sinuati verso la base, il capo nettamente più stretto del pronoto e gli antennomeri 4° a 10° non fortemente trasversi, come in *angustula*.



FIGG. 7–12

Habitus, spermateca ed edeago in visione laterale e ventrale. 7–8: *Heterostiba uhligi* sp. n.; 9–12: *Dinusella aequinoctialis* sp. n.

Etimologia. Il nome della nuova specie deriva dai Chibcha, popolazione che si stanziò sugli altipiani della Colombia al tempo della conquista spagnola.

Apalonia sanctipetri sp. n. (Figg. 15–16)

Tipo. Holotypus ♀, N. Kolumbien nördwestl. Sierra Nevada de Sta. Marta, ca. 1000 m, nahe San Pedro de la Sierra, 12.IV.1986, aus Fall-Laub, (Müller leg., MG).

Descrizione. Lunghezza 2,9 mm. Corpo lucidissimo e nero; elitre e base ed ertremità dell'addome brune; Antenne brune con i due antennomeri basali e l'undicesimo giallo-rossicci; zampe gialle con femori bruni. L'intero corpo è privo di reticolazione. I tubercoletti della superficie del capo sono distinti, quelli delle elitre sono svaniti. La punteggiatura del pronoto è poco distinta. spermateca fig. 15.

Comparazioni. La nuova specie è distinta a da *A. confinis* (Sharp, 1883), del Guatemala, perché non ha i penultimi antennomeri trasversi; da *A. setigera* (Sharp, 1883), pure del Guatemala, è distinta perché il terzo antennomero non è notevolmente più lungo del secondo come in *setigera*, perché il pronoto non è fortemente trasverso come in *setigera* e perché è priva di numerose setole erette ai lati del corpo.

Apalonia marginifera sp. n. (Figg. 17–18)

Tipi. Holotypus ♀, Kolumbien, Villa Culebra bei Bonda, ca. 10 Km E, Sta. Marta, XI–XII.1985, Barberfallen, (Müller leg., MG).

Paratypus: 1 ♀, stessa provenienza, ma in data X.1985.

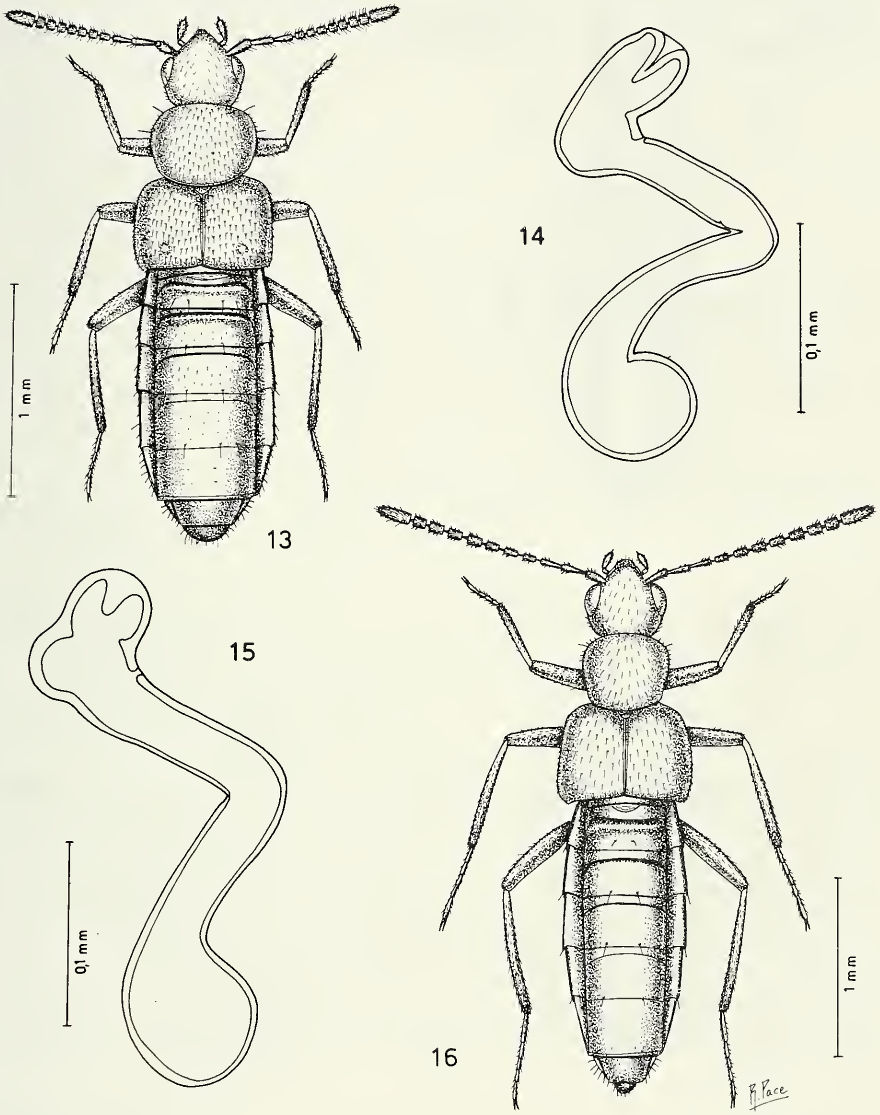
Descrizione. Lunghezza 2,3 mm. Corpo lucidissimo e nero; margine posteriore delle elitre giallo; antenne brune con i due antennomeri basali bruno-rossicci; femori neri, tibie rossicce e tarsi gialli. La reticolazione del capo e del pronoto è estremamente svanita, quella delle elitre e dell'addome è assente. La punteggiatura della superficie del capo e del pronoto è poco distinta. Le elitre sono coperte di tubercoletti salienti. Spermateca fig. 18.

Comparazioni. Specie ben distinta da *A. angustula.* (Casey, 1893), della Florida, nonostante l'identica taglia (2,3 mm), perché il terzo antennomero è lungo quanto il secondo e non più lungo del secondo come in *angustula* e per il differente colore delle elitre: nere con margine posteriore giallo nella nuova specie, nero pece scuro, con omeri e uno stretto margine apicale giallo in *angustula.*

Apalonia bondensis sp. n. (Figg. 19–20)

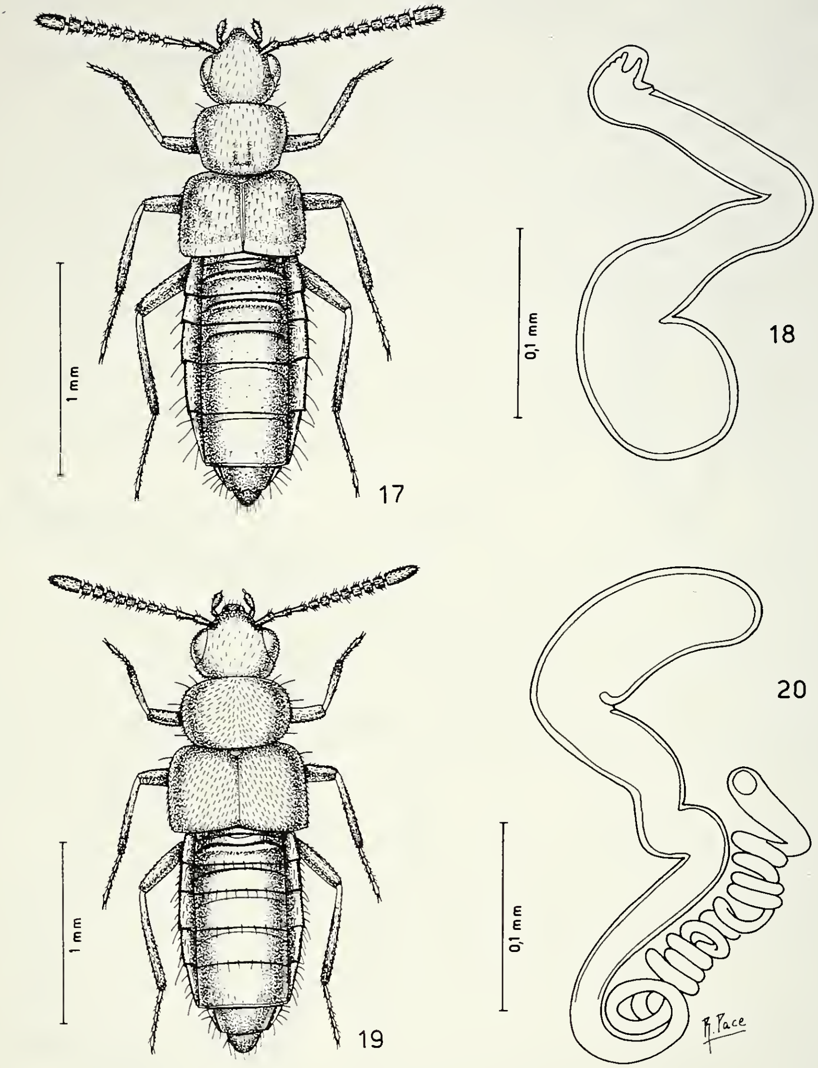
Tipo. Holotypus ♀, Nord-Kolumbien, Dept. Magdalena Villa Culebra bei Bonda, ca. 10 Km östlich Sta. Marta, X.1985, Trockengebiet, Barberfallen, (Müller leg., MG).

Descrizione. Lunghezza 2,6 mm. Corpo lucidissimo e bruno-gialliccio; elitre brune con base gialla; base ed estremità dell'addome giallo-rossicce; antenne brune con i tre antennomeri basali giallo-rossicci; zampe gialle. Una reticolazione estremamente svanita sta sulla superficie delle elitre: sul resto del corpo non vi è reticolazione. La punteggiatura del capo è fine, quella delle elitre è indistinta. Tubercoletti poco visibili stanno sulla superficie del pronoto. Spermateca fig. 20.



FIGG. 13–16

Habitus e spermateca. 13–14: *Apalonia chibcha* sp. n.; 15–16: *Apalonia sanctipetri* sp. n.



FIGG. 17–20

Habitus e spermateca. 17–18: *Apalonia marginifera* sp. n.; 19–20: *Apalonia bondensis* sp. n.

Comparazioni. Specie distinta da *A. angustula* (Casey, 1893), della Florida, per avere le antenne brune con base giallo-rossiccia e non interamente giallo-rossicce, come in *angustula* e per avere occhi più sviluppati, cosicché le tempie sono sfuggenti e non largamente arcuate come in *angustula*.

Apalonia fuscofemoralis sp. n. (Figg. 21–24)

TIPI. Holotypus ♂, Kolumbien, Villa Culebra bei Bonda, ca. 10 Km E Sta. Marta, XI–XII.1985, (Müller leg., MG).

Paratypi: 3 ♀♀, stessa provenienza.

Descrizione. Lunghezza 2,6 mm. Corpo lucido e nero pece; omeri, margine posteriore delle elitre e dei tre uriti basali, gialli; antenne brune con antennomero basale e l'undicesimo giallo-rossicci; zampe gialle con metà distale dei femori posteriori bruniccia. Il capo e il pronoto sono coperti di reticolazione netta e di tubercoletti distinti. La reticolazione delle elitre e dell'addome è assente. La punteggiatura delle elitre è fine. Edeago figg. 22–23, spermateca fig. 24.

Comparazioni. La nuova specie è nettamente distinta da *A. angustula* (Casey, 1893), della Florida, poiché il decimo antennomero è lungo quanto largo e non fortemente trasverso come in *angustula* e per i femori posteriori a metà brunicci e non interamente gialli come in *angustula*.

Apalonia marginella sp. n. (Figg. 25–28)

TIPI. Holotypus ♂, Kolumbien, Villa Culebra bei Bonda, ca. 10 Km E Sta. Marta, XI–XII.1985, Barberfallen, (Müller leg., MG).

Paratypi: 19 es., stessa provenienza.

Descrizione. Lunghezza 2,6 mm. Corpo lucido e bruno; pronoto giallo-rossiccio; omeri, margine posteriore delle elitre e uriti liberi primo e secondo gialli; antenne bruno-rossicce con i tre antennomeri terminali giallo-rossicci; zampe giallo-rosicce. L'avancorpo è privo di reticolazione ed è coperto di tubercoletti fitti. Gli urotergi, tranne ai lati sono privi di pubescenza. Edeago figg. 26–27, spermateca fig. 28.

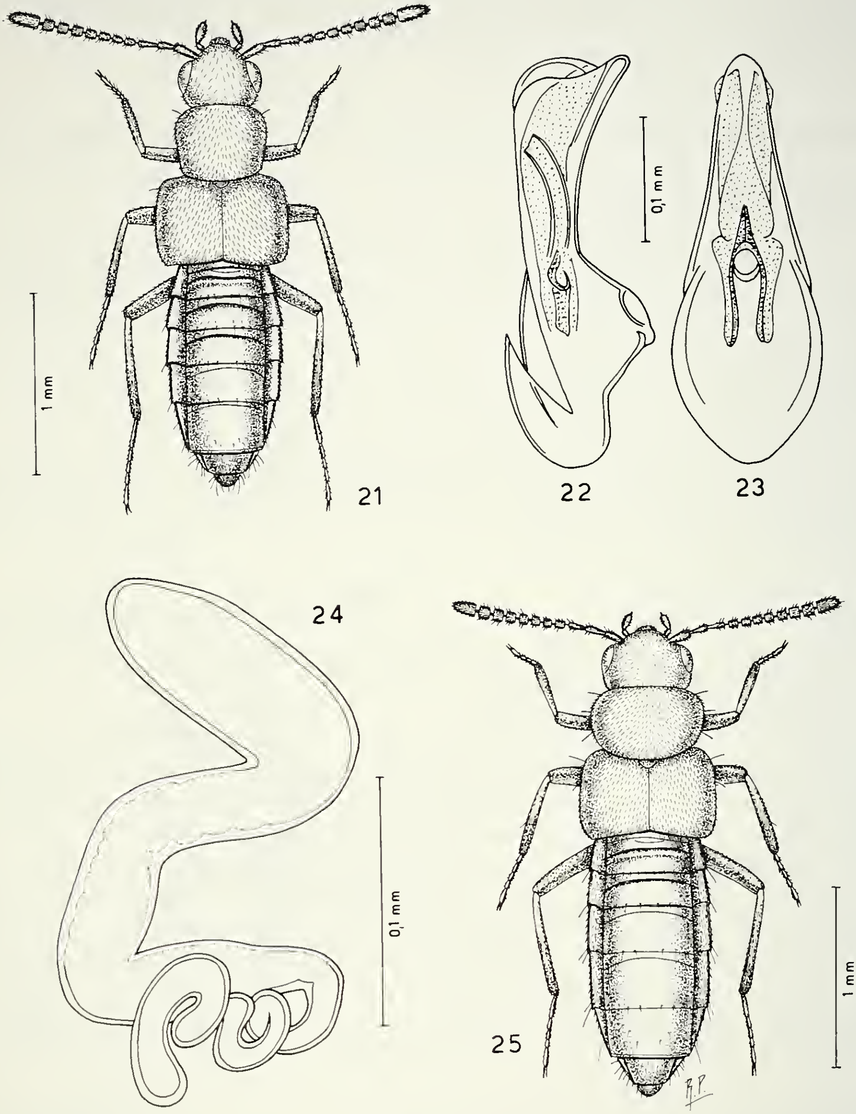
Comparazioni. La nuova specie è distinta da *A. angustula* (Casey, 1893), della Florida, poiché ha antenne brune, gradualmente gialle dal sesto antennomero e non antenne interamente giallo-rossicce, come in *angustula*, e il decimo antennomero è appena trasverso e non fortemente trasverso come in *angustula*. Inoltre i lati del pronoto della nuova specie non sono largamente sinuati davanti agli angoli posteriori, come quelli di *angustula*.

Apalonia stilifera sp. n. (Figg. 29–32)

TIPI. Holotypus ♂, Ecuador, Cotopaxi prov., loc. Naranchito, 2000 m, c/o San Francisco de Las Pampas, 3.II.1993, (L. Bartolozzi leg., N° 9833, MF).

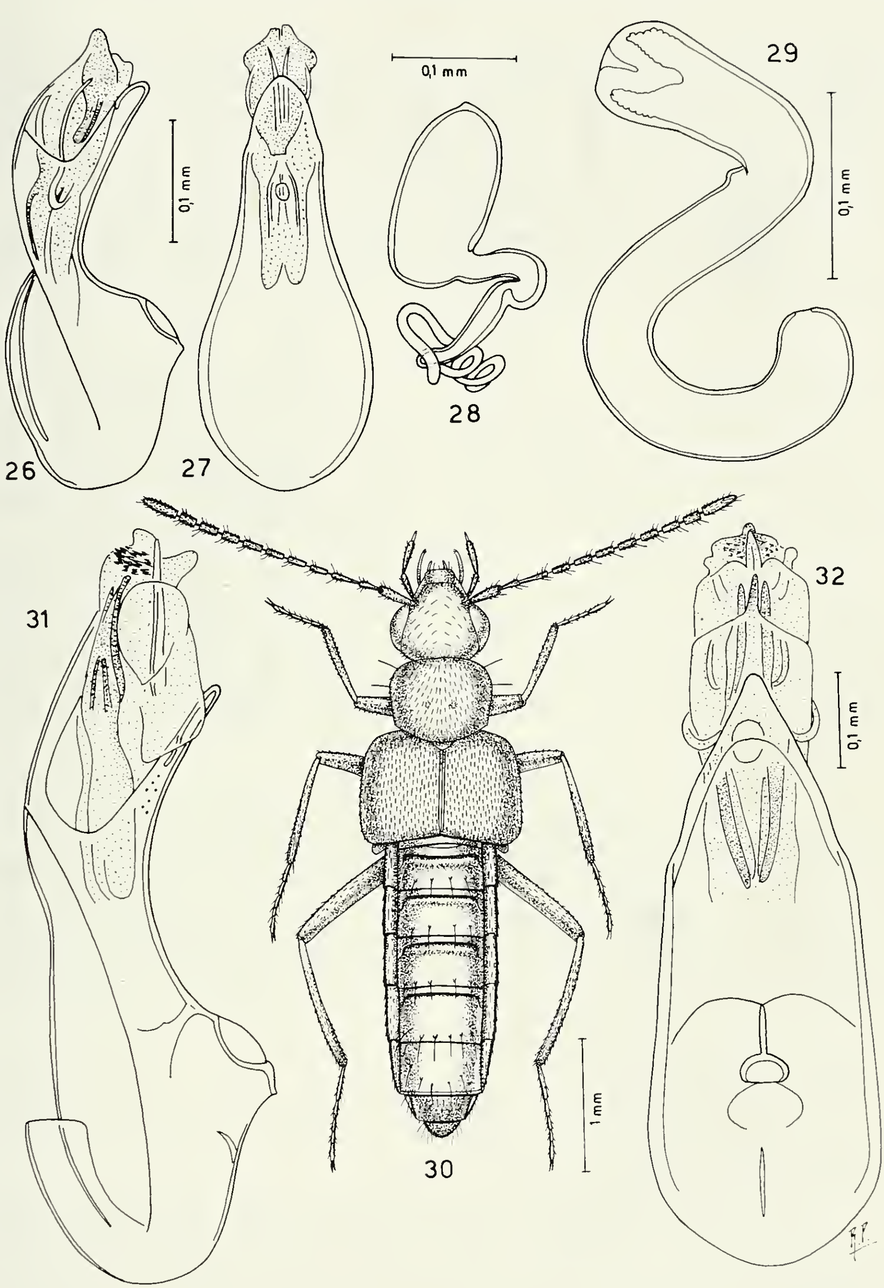
Paratypi: 2 ♀♀, stessa provenienza (N° 9834).

Descrizione. Lunghezza 4,3 mm. Corpo lucido. Capo e quarto urite libero neri; pronoto bruno con margini laterali e posteriore rossicci; elitre brune con base giallo-bruna; addome bruno (tranne il quarto urite) con lati ed estremità bruno-rossicci;



FIGG. 21–25

Habitus, edeago in visione laterale e ventrale e spermateca. 21–24: *Apalonia fuscofemoralis* sp. n.; 25: *Apalonia marginella* sp. n.



FIGG. 26–32

Edeago in visione laterale e ventrale, spermateca e habitus. 26–28: *Apalonia marginella* sp. n.; 29–32: *Apalonia stilifera* sp. n.

antenne brune con i due antennomeri basali, i tre quarti basali del terzo e la base del quarto e del quinto gialli; undicesimo antennomero giallo-rossiccio sfumato di bruno verso la base; zampe gialle. La reticolazione del capo e del pronoto è estremamente svanita, quella sul resto del corpo è assente. La punteggiatura del capo è quasi indistinta, quella del pronoto è fine e distinta e quella delle elitre è fitta e un po' svanita. Spermateca fig. 29, edeago figg. 31–32.

Comparazioni. Finora nel genere *Apalonia* Casey, 1906, non erano note specie di così grande taglia (4,3 mm) e con antenne lunghissime come quelle della nuova specie.

Apalonia pampeana sp. n. (Figg. 33–36)

Tipi. Holotypus ♂, Ecuador, Cotopaxi, S. Francisco de Las Pampas, 1300–1500 m, II.1993, (L. Bartolozzi leg., N° 9838, MF).

Paratypi: 58 es., stessa provenienza (N° 9839); 20 es., Ecuador, loc. Naranchito 2000 m, c/o S. Francisco de Las Pampas, 3.II.1993 (N° 9839, MF, MQ); 3 es., Ecuador, Manabi, dint. Puerto Cayo, 21.II.1993, (L. Bartolozzi & G. Onore leg., N° 9839, MF, MQ).

Descrizione. Lunghezza 3,0 mm. Corpo lucido. Capo nero; pronoto, antenne, zampe e i due uriti liberi basali gialli; elitre brune con base giallo-bruna; uriti liberi terzo, quarto e metà basale del quinto nero-bruni. La reticolazione del capo è netta, quella del pronoto è svanita e quella delle elitre e dell'addome è assente. La punteggiatura del capo è fine e quasi indistinta, quella delle elitre è pure fine, ma ben distinta. Il pronoto è coperto di tubercoletti salienti e fini. Edeago figg. 34–35, spermateca fig. 36.

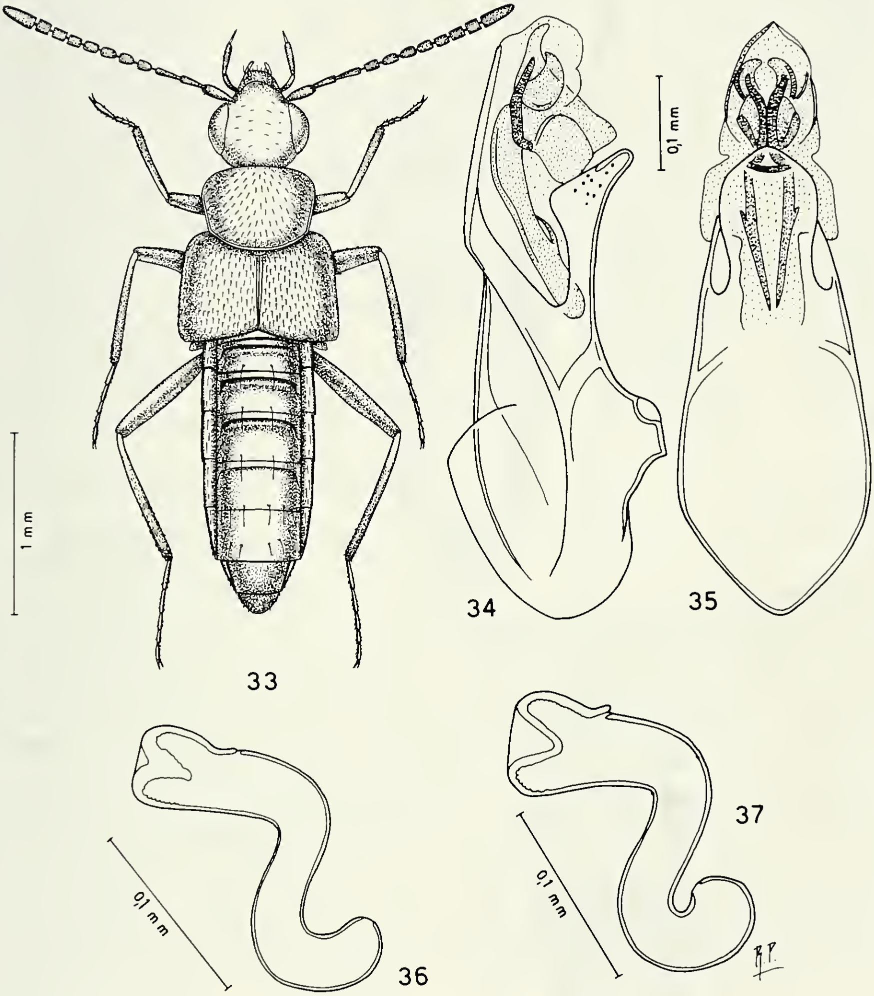
Comparazioni. Specie di taglia simile (3,0 mm) a quella di *A. confinis* (Sharp, 1883) e di *A. setigera* (Sharp, 1883), entrambe del Guatemala. La nuova specie è distinta da *A. confinis* per avere le antenne interamente gialle e non antenne scure alla base e gialle all'estremità come in *confinis* e per il capo nero e il pronoto giallo-rossiccio (capo e pronoto bruni in *confinis*). La nuova specie è pure distinta da A. setigera per il differente colore del corpo: capo nero nella nuova specie, capo giallo-rossiccio in *setigera*, e perché è priva di setole erette ai lati del corpo, presenti al contrario in *setigera*.

Apalonia circumflexa sp. n. (Figg. 37–40)

Tipi. Holotypus ♂, Ecuador, Manabi, dint. Puerto Lopez, 20.II.1993, (L. Bartolozzi & G. Onore leg., N° 9835, MF).

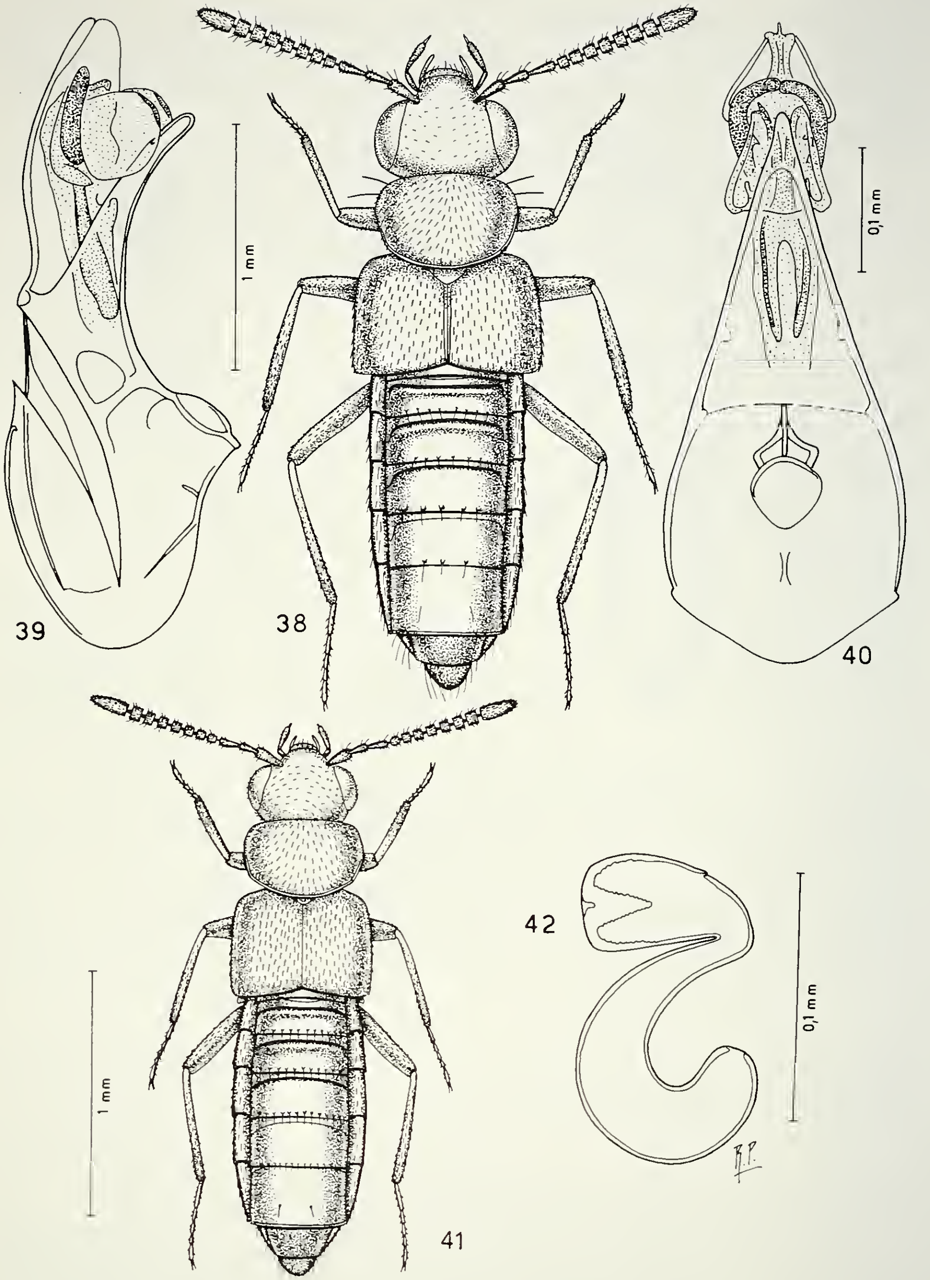
Paratypi: 3 es., stessa provenienza (N° 9836).

Descrizione. Lunghezza 2,3 mm. Corpo lucido. Capo nero con disco bruno-rossiccio; pronoto e i due uriti basali giallo-rossicci; elitre bruno-giallicce; uriti liberi terzo, quarto e quinto bruno rossicci; antenne giallo-rossicce; zampe gialle. La reticolazione del capo e del pronoto è svanita, quella delle elitre è estremamente superficiale e quella dell'addome è assente. La punteggiatura del capo è fine e svanita, quella delle elitre è pure fine, ma distinta. Il pronoto presenta una superficie coperta di tubercoletti fini e fitti. Spermateca fig. 37, edeago figg. 39–40.



FIGG. 33–37

Habitus, edeago in visione laterale e ventrale e spermateca. 33–36: *Apalonia pampeana* sp. n.; 37: *Apalonia circumflexa* sp. n.



FIGG. 38–42

Edeago in visione laterale, habitus, edeago in visione ventrale e spermateca. 38–40: *Apalonia circumflexa* sp. n.; 41–42: *Apalonia ancilla* sp. n.

Comparazioni. Specie ben distinta da *A. angustula* (Casey, 1893), della Florida, per avere gli occhi molto sviluppati, sicché le tempie sono sfuggenti e cortissime e non largamente arcuate come in *angustula* e per il pronoto fortemente trasverso (lievemente trasverso in *angustula*).

Apalonia ancilla sp. n. (Figg. 41–42)

TIPO. Holotypus ♀, Ecuador, Manabi, dint. Puerto Lopez, 20.II.1993, (L. Bartolozzi & G. Onore leg., N° 9837, MF).

Descrizione. Lunghezza 2,2 mm. Corpo lucido. Capo e uriti liberi terzo, quarto e quinto neri; resto del corpo bruno; antenne nero-brune con i tre antennomeri basali gialli e metà apicale dell'undicesimo giallo-rossiccia; zampe gialle. Solo il pronoto presenta una reticolazione che è svanita, il resto del corpo ne è privo. Il capo e le elitre sono coperti di punteggiatura fine e distinta. La punteggiatura sul pronoto è svanita. Spermateca fig. 42.

Comparazioni. Specie ben distinta da *A. angustula* (Casey, 1893), della Florida, per gli occhi molto sviluppati, per il pronoto molto trasverso e per il colore delle antenne e delle elitre (con omeri gialli in *angustula*).

Orphnebius (Microrphnebius) granulifer sp. n. (Figg. 43–45)

TIPO. Holotypu ♂, Kolumbien, Villa Culebra bei Bonda, ca. 10 Km E Sta. Marta, XI–XII.1985, Barberfallen, (Müller leg., MG).

Descrizione. Lunghezza 1,7 mm. Corpo lucido e nero-bruno, con margini posteriori degli uroterghi rossicci; antenne brune con i tre antennomeri basali giallo-rossicci; femori bruni, tibie rossicce e tarsi giallo-rossicci. La reticolazione sul capo e sul pronoto è assente, quella delle elitre è netta e quella dell'addome è composta di maglie lievemente trasverse e nette, però il quinto urotergo libero mostra reticolazione a maglie non trasverse; Il capo e il pronoto sono coperti di punteggiatura fine. Le elitre presentano una superficie coperta di netti tubercoletti. Il sesto urotergo libero del maschio ha una debole carena mediana. Il primo urotergo libero del maschio mostra un tubercolo mediano molto saliente. Edeago figg. 44–45.

Comparazioni. Specie simile a *O. franzi*, Pace, 1985, del Venezuela. Ne è distinta per avere l'edeago a punta ogivale (in visione ventrale) e non a punta acuta come in *franzi* e per la presenza di un tubercolo o granulo sul primo urotergo libero del maschio, assente in *franzi*.

Orphnebius (s. str.) **magdaleniensis** sp. n. (Figg. 46–47)

TIPI. Holotypus ♀, Kolumbien, Villa Culebra bei Bonda, ca. 10 Km E Sta. Marta, XI–XII.1985, Barberfallen, (Müller leg., MG).

Paratypus: 1 ♀, stessa provenienza.

Descrizione. Lunghezza 2,3 mm. Corpo lucidissimo e nero; pronoto e base dell'addome nero-bruni; antenne nere con i tre antennomeri basali bruno-rossicci; zampe nere con tarsi giallo-rossicci. Sul corpo non vi è traccia di reticolazione. La punteggiatura del capo è indistinta. I tubercoletti sparsi sul pronoto sono fini e superficiali, quelli delle elitre sono molto salienti. Spermateca fig. 47.

Comparazioni. Finora non è nota alcuna specie del genere *Orphnebius* Motschulsky, 1858, con una spermateca simile a quella della nuova specie, caratterizzata da una profondissima introflessione apicale del bulbo distale e scolpita a squamule all'interno del tubulo mediano.

Orphnebius (s. str.) **trifurcatus** sp. n. (Figg. 48–49)

TIPO. Holotypus ♀, Kolumbien, Dept. Magdalena, Cañaveral, Tayrona Park, ca. 40 Km NE Sta. Marta, 11.VIII.1985, (Müller leg., MG).

Descrizione. Lunghezza 3,6 mm. Corpo lucidissimo e giallo-rossiccio; capo rossiccio; elitre brune con base gialla; antenne rossicce con i due antennomeri basali giallo-rossicci; zampe giallo-rossicce. La reticolazione è assente su tutto il corpo. La punteggiatura dell'avancorpo è superficiale: ciascun punto è grande. Il sesto urotergo libero della femmina è coperto di reticolazione distinta e porta un tubercolo alla base del dente mediano. Spermateca fig. 49.

Comparazioni. La nuova specie, in base alla forma della spermateca e dell'habitus, è tassonomicamente affine a *O. importunus* (Erichson, 1840), **comb. n.** (della Colombia) ("olim" *Brachida importuna* Erichson, 1840). Ne è distinta poiché il bulbo distale della spermateca della nuova specie è stretto e ha una profonda introflessione apicale, mentre quello di *importunus* è larghissimo e privo di introflessione apicale. Inoltre il dente mediano del margine posteriore del sesto urotergo libero del maschio è triangolare in *importunus* e stretto, a lati paralleli nella nuova specie.

Orphnebius (s. str.) **ecuadorensis** sp. n. (Figg. 50–54)

TIPI. Holotypus ♂, Ecuador, Manabi, dint. Puerto Lopez, 20.II.1993, (L. Bartolozzi & G. Onore leg., N° 9828, MF).

Paratypi: 14 es., stessa provenienza, (N° 9829, MF, MQ); 2 es., Ecuador, Manabi, dint. Puerto Cayo, 21.II.1993, (L. Bartolozzi & G. Onore leg.).

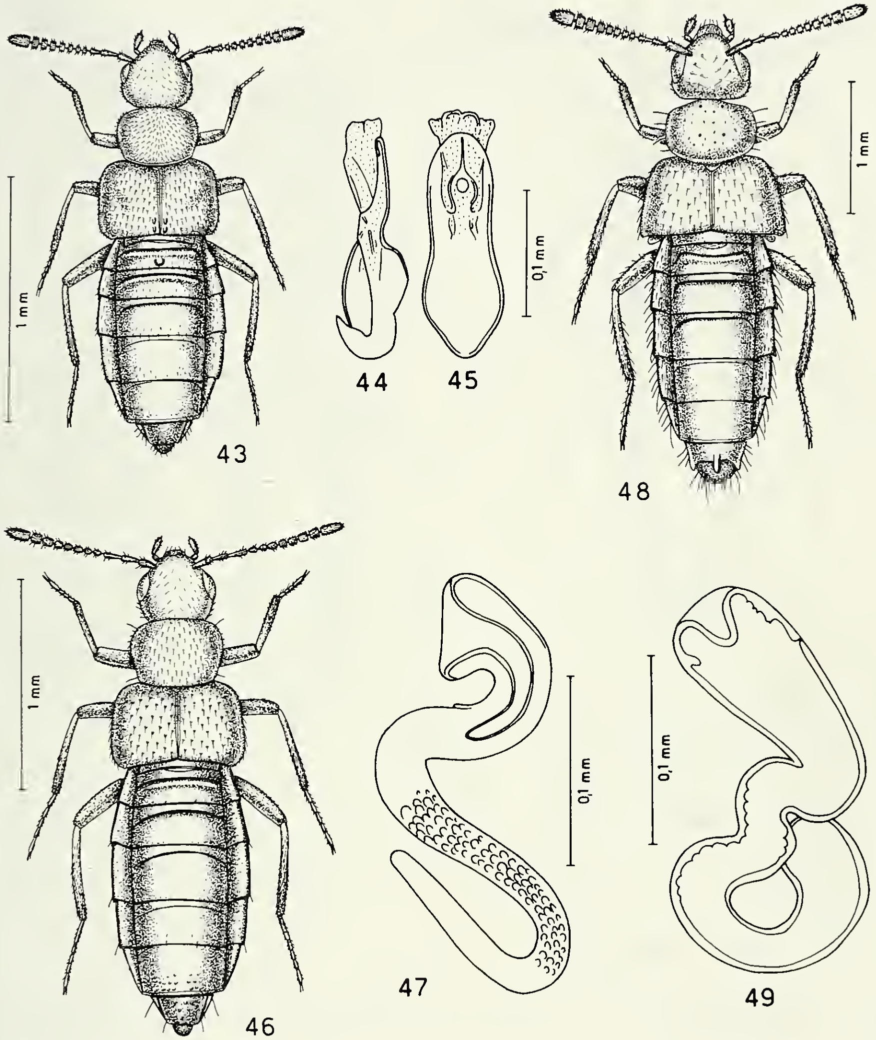
Descrizione. Corpo lucido e rossiccio con capo bruno; antenne giallo-rossicce; zampe rossicce. Su tutto il corpo non esiste reticolazione. La punteggiatura del capo e delle elitre è distinta: quella del capo in più è ombelicata. Il pronoto non presenta punteggiatura. Edeago figg. 51–52, spermateca fig. 53, sesto urotergo libero del maschio fig. 54.

Comparazioni. Specie simile, anche per la forma della spermateca a *O. importunus* (Erichson, 1840) della Colombia. Ma gli occhi nella nuova specie sono molto più sviluppati, sicché le tempie sono assenti (tempie ben arcuate in *importunus*). La spermateca della nuova specie presenta una netta introflessione apicale del bulbo distale che è stretto, mentre l'introflessione apicale è assente nel bulbo distale che è molto sviluppato in *importunus*. L'edeago di *importunus* non è noto.

Orphnebius (s. str.) **vescicularis** sp. n. (Figg. 55–57)

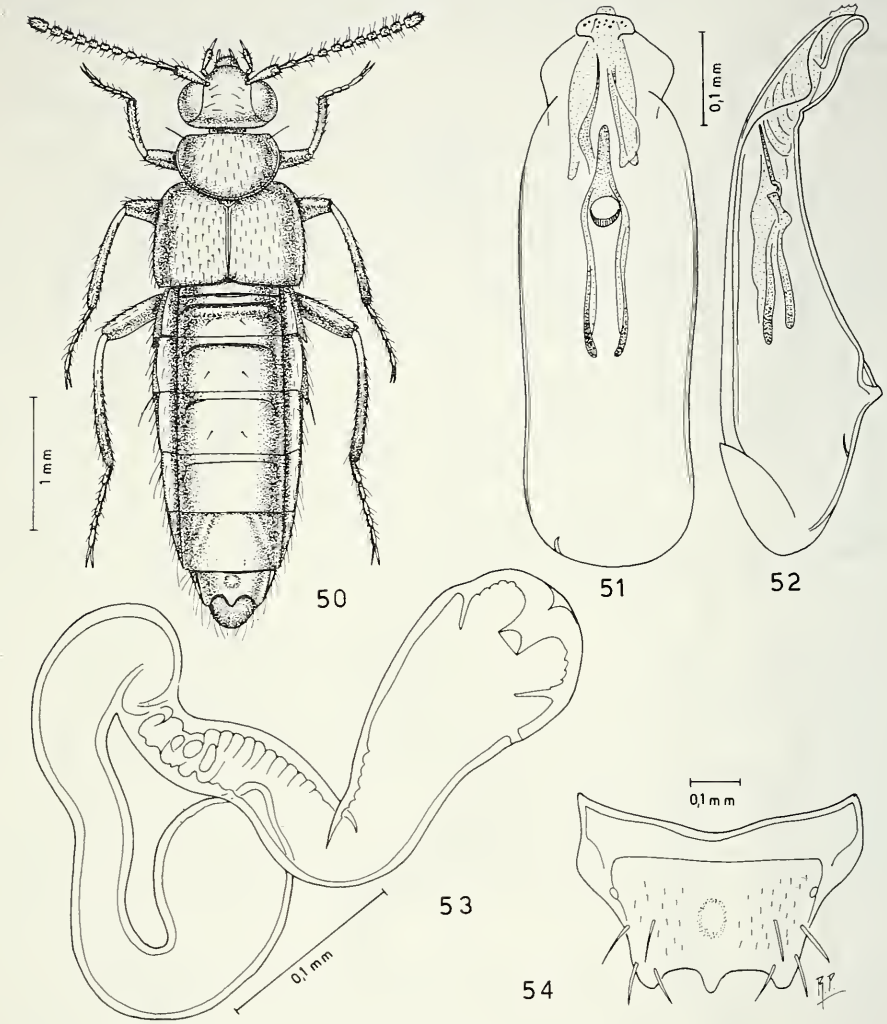
TIPO. Holotypus ♀, Ecuador, Manabi, dint. Puerto Lopez, 20.II.1993, (L. Bartolozzi & G. Onore leg., N° 9825, MF).

Descrizione. Lunghezza 2,6 mm. Corpo lucido e giallo-rossiccio sporco con capo nero e parte posteriore delle elitre sfumata di bruno; antenne e zampe gialle. Non



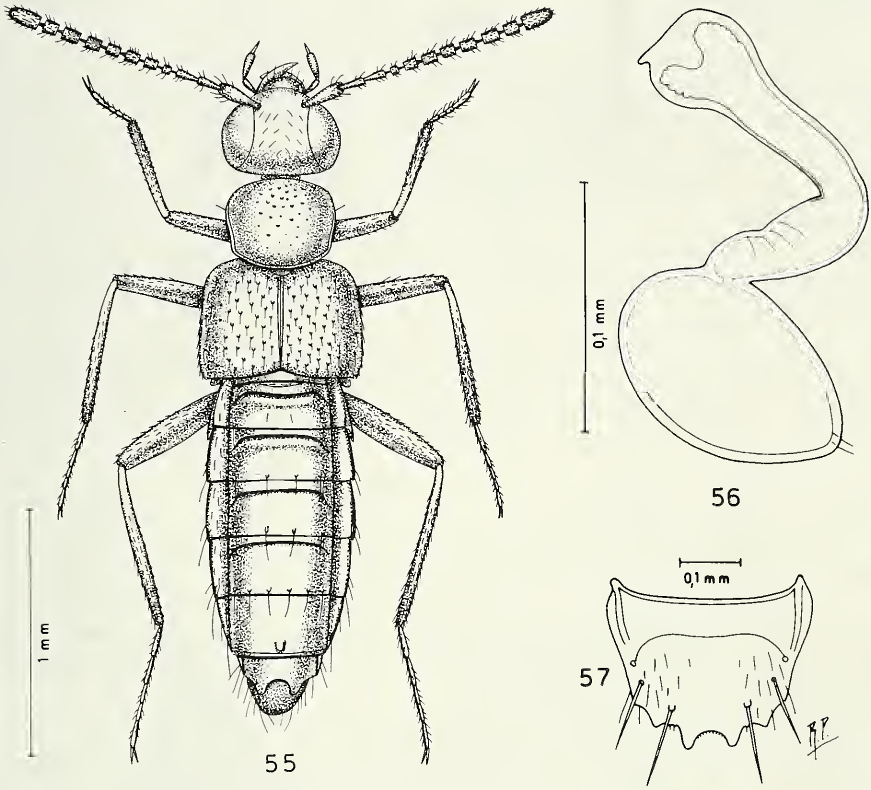
FIGG. 43–49

Habitus, edeago in visione laterale e ventrale e spermateca. 43–45: *Orphnebius (Microrphnebius) granulifer* sp. n.; 46–47: *Orphnebius (s. str.) magdaleniensis* sp. n.; 48–49: *Orphnebius* (s. str.) *trifurcatus* sp. n.



FIGG. 50–54

Habitus, edeago in visione ventrale e laterale, spermateca e sesto urotergo libero del maschio. 50–54: *Orphnebius* (s. str.) *ecuadorensis* sp. n.



FIGG. 55–57

Habitus, spermateca e sesto urotergo libero della femmina. 55–57: *Orphnebius* (s. str.) *vescicularis* sp. n.

esiste reticolazione su tutto il corpo. I tubercoletti della superficie del capo e del pronoto sono ben salienti: quelli del pronoto sono più fitti in avanti e sulla linea mediana. Le elitre presentano tubercoletti della loro superficie molto salienti. Spermateca fig. 56, sesto urotergo libero della femmina fig. 57.

Comparazioni. Finora non è nota alcuna specie con occhi enormi e con spermateca così caratteristica come nella nuova specie, cioè con bulbo prossimale ipertrofico, tanto da simulare una vescicola.

Macrogerodonia colombiana sp. n. (Figg. 58–61)

TIPI. Holotypus ♂, Kolumbien, Villa Culebra, ca. 10 Km E Sta. Marta, XI–XII.1985, Barberfallen, (Müller leg., MG).

Paratypi: 3 ♂♂ e 1 ♀, stessa provenienza.

Descrizione. Lunghezza 5,0 mm. Corpo lucidissimo e giallo-rossiccio con capo rossiccio; antenne e zampe giallo-rossicce. Assente è la reticolazione su tutto il corpo, tranne sugli uriti liberi quinto e sesto dove una reticolazione vigorosa d'aspetto di velluto sta tra i tubercoli allungati. La punteggiatura del capo è scabra e netta. I tubercoli che coprono la superficie del pronoto sono molto sviluppati e molto salienti, ma assenti sulla linea mediana, ai lati e lungo il margine posteriore. Vi è un'impressione discale del pronoto. Le elitre presentano una superficie coperta di tubercoletti salienti, ben sviluppati in avanti e gradualmente più piccoli all'indietro. Edeago figg. 59–60, spermateca fig. 61.

Comparazioni. La nuova specie è simile a M. *magnicollis* Bernhauer, 1941, del Perù. Ne è distinta per avere gli antennomeri quarto a decimo nettamente più lunghi che larghi (e non trasversi come in *magnicollis*) e l'edeago meno slanciato, con bulbo basale ben distinto (bulbo basale non distinto in *magnicollis*).

Zyras (s. str.) **paecesanus** sp. n. (Figg. 62–63)

TIPO. Holotypus ♀, Kolumbien, Punta de Betin, Sta. Marta, XI–XII.1985, Barberfallen, (Müller leg., MG).

Descrizione. Lunghezza 4,7 mm. Corpo lucidissimo e giallo-rossiccio, comprese antenne e zampe, con angoli posteriori esterni largamente bruni. Sul corpo non vi è traccia di reticolazione. La punteggiatura dell'avancorpo è robusta e profonda. Spermateca fig. 63.

Comparazioni. La nuova specie differisce da *Z. distinctus* Bierin, 1937, di Cuba, per avere il capo e il pronoto profondamente punteggiati e non coperti di tubercoletti, per l'assenza di un'impressione longitudinale mediana sul capo della nuova specie, presente, al contrario, in *distinctus* e per le antenne interamente giallo-rossicce e non nere con i due antennomeri basali giallo-rossicci, come si osserva in *distinctus*.

Etimologia. Dai Paeces, popolazione caraibica precolombiana della Colombia.

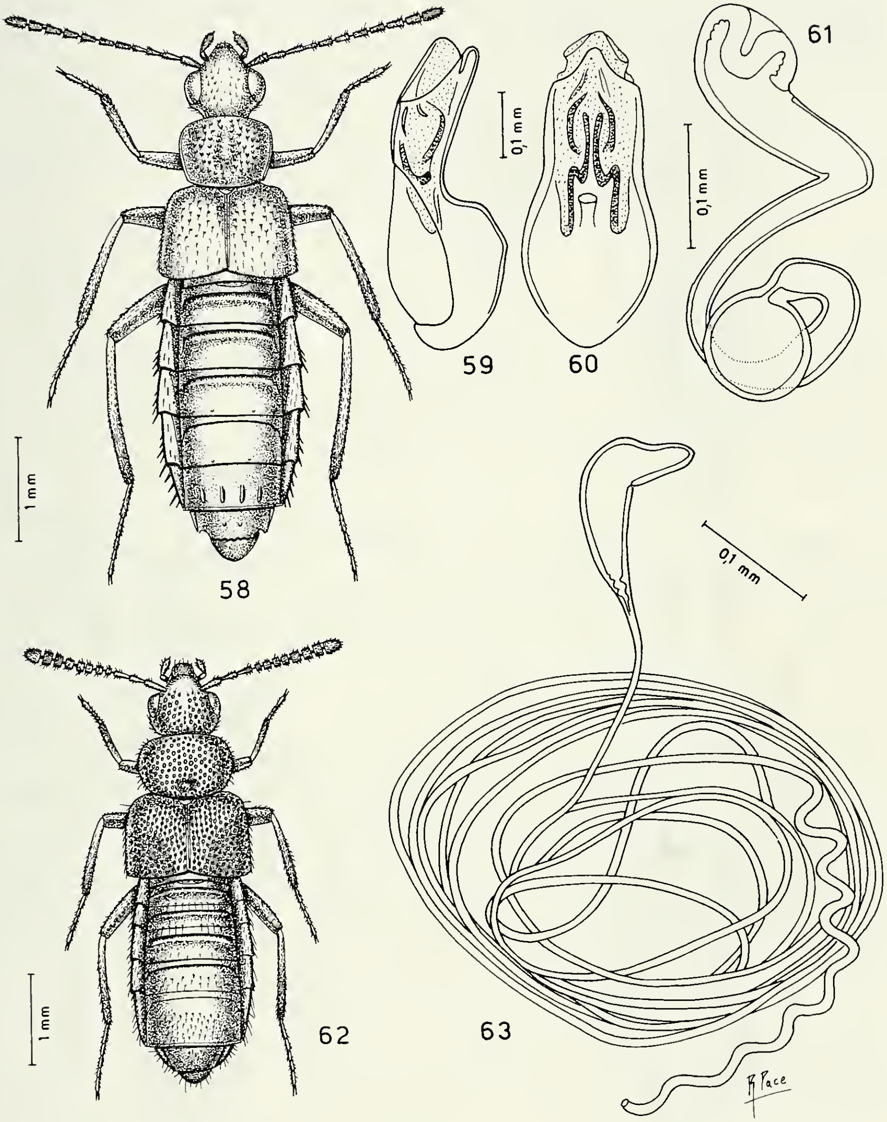
OXYPODINI

Idiostiba puthzi sp. n. (Figg. 64–67)

TIPI. Holotypus ♂, Nord-Kolumbien, nörd. Sierra Nevada de Sta. Marta, San Lorenzo, 2200 m, 18–24.VII.1985, Nadelwald, Cupressus sp., (Müller leg., MG).

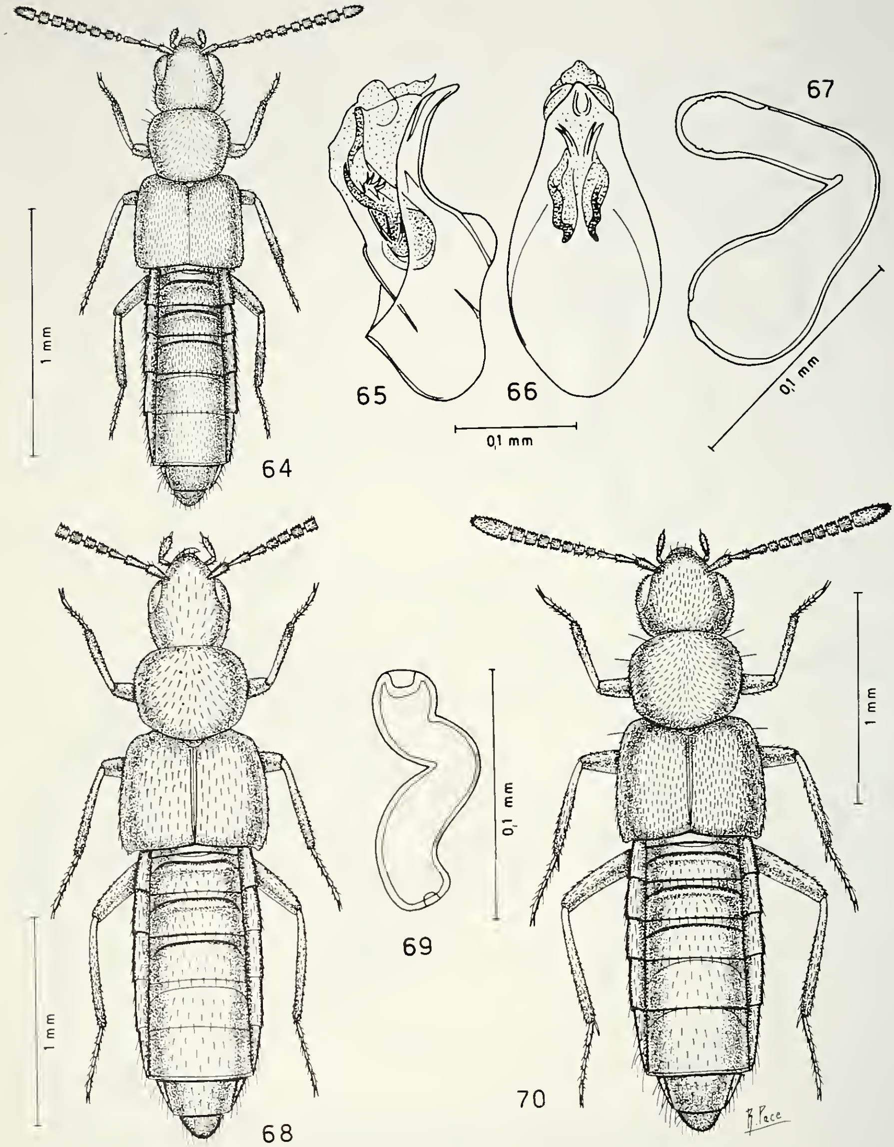
Paratypi: 115 es., stessa provenienza; 1 ♀, idem, ma nähe El Campano, ca. 1000 m, 20.IV.1986, aus Fall-Laub, (Müller leg.).

Descrizione. Lunghezza 2,2 mm. Corpo debolmente lucido e bruno; antenne brune con antennomero basale giallo-bruno; zampe rossicce. La reticolazione dell'avancorpo è netta: quella delle elitre è a maglie ampie. La punteggiatura o i tubercoletti dell'avancorpo non sono distinti. Edeago figg. 65–66, spermateca fig. 67.



FIGG. 58–63

Habitus, edeago in visione laterale e ventrale e spermateca. 58–61: *Macrogerodonia colombiana* sp. n.; 62–63: *Zyras* (s. str.) *paecesanus* sp. n.



FIGG. 64–70

Habitus, edeago in visione laterale e ventrale e spermateca. 64–67: *Idiostiba puthzi* sp. n.; 68–69: *Idiostiba manabicola* sp. n.; 70: *Haplochara ecuadorica* sp. n.

Comparazioni. La nuova specie è distinta da *I. franzi* Pace, 1990, dell'Argentina, perché ha occhi lunghi quanto le tempie e non molto più corti come in *franzi* e per le elitre notevolmente più corte di quelle di *franzi*. La spermateca della nuova specie è grande quasi il doppio di quella di *franzi* ed è priva di profonda introflessione apicale del bulbo distale.

Etimologia. Specie dedicata al Dr Volker Puthz di Schlitz, noto studioso di Steninae. Egli mi ha affidato in studio le Aleocharinae della Colombia raccolte dal Dr Müller.

Idiostiba manabicola sp. n. (Figg. 68–69)

TIPO. Holotypus ♀, Ecuador, Manabi, dint. Puerto Lopez, 20.II.1993, (L. Bartolozzi & G. Onore leg., N° 9831, MF).

Descrizione. Lunghezza 2,8 mm. Corpo lucido e bruno con pronoto e la base e l'estremità dell'addome di un giallo sporco; antenne nere con antennomero basale giallo e il secondo antennomero bruno (antenne incomplete: sono andati perduti forse in fase di raccolta, gli ultimi quattro antennomeri); zampe giallo-rossicce. Sull'intero corpo non è presente la reticolazione della superficie. La punteggiatura dell'avancorpo è svanita; quella dell'addome è distinta.

Comparazioni. La nuova specie è distinta da *I. franzi* Pace, 1990, dell'Argentina, poiché ha pronoto più trasverso, il quarto antennomero lungo quanto largo e non molto trasverso come in *franzi* e per la tronca introflessione apicale del bulbo distale della spermateca (in *franzi* introflessione acutissima).

Haplochara ecuadorica sp. n. (Figg. 70–71)

TIPO. Holotypus ♀, Ecuador, Napo Rio Hollin, 9–13.II.1993, (L. Bartolozzi leg., N° 9826, MF).

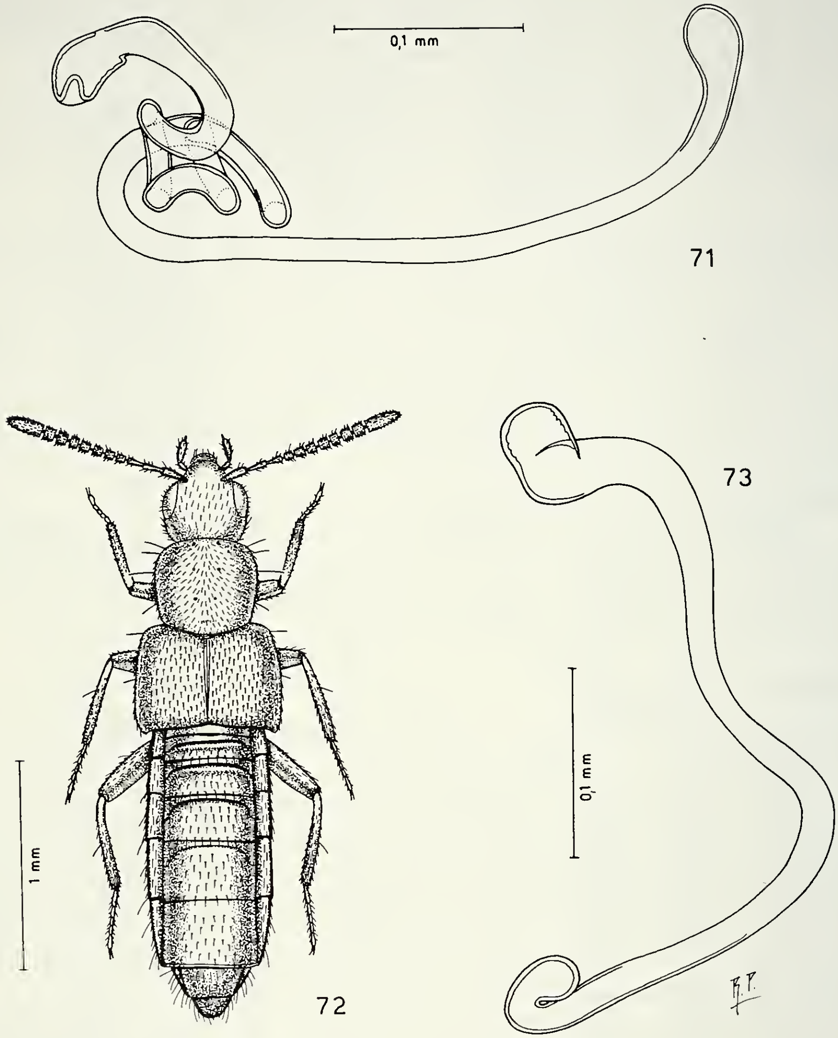
Descrizione. Lunghezza 2,8 mm. Corpo lucido e nero; antenne nere con antennomero basale rossiccio; zampe nere con ginocchia ed estremità delle tibie rossicce e con tarsi giallo-bruni. La reticolazione del capo è estremamente svanita, quella del pronoto è distinta, quella delle elitre è netta e quella dell'addome è a maglie molto trasverse molto svanite: solo sul quinto urotergo libero la reticolazione a maglie molto trasverse è netta. La punteggiatura del capo è scabra, fitta e svanita. Il pronoto e le elitre sono coperti di tubercoletti fitti e superficiali. Spermateca fig. 71.

Comparazioni. Specie affine a *H. franzi* Pace, 1985, del Venezuela, ma la taglia è minore (2,8 mm, invece di 3,6 mm), il pronoto è nettamente trasverso (appena in *franzi*) e la spermateca ha dimensioni minori, con profonda introflessione apicale del bulbo distale, assente in *franzi*.

Haplochara bartolozzii sp. n. (Figg. 72–73)

TIPO. Holotypus ♀, Ecuador, Napo Rio Hollin, 1200 m, 9–13.II.1993, (L. Bartolozzi leg., N° 9827, MF).

Descrizione. Lunghezza 2,7 mm. Corpo lucido e bruno con capo, metà posteriore delle elitre e uriti liberi quarto e quinto neri; antenne nere con antennomero



Figg. 71–73

Spermateca e habitus. 71: *Haplochara ecuadorica* sp. n.; 72–73: *Haplochara bartolozzii* sp. n.

basale giallo; zampe gialle. Il capo e il pronoto sono privi di reticolazione. La reticolazione delle elitre è svanita, quella dell'addome è a maglie molto trasverse e distinte. La punteggiatura del capo è superficiale: ciascun punto è grande. La punteggiatura del pronoto è fine e quella delle elitre è distinta. Spermateca fig. 73.

Comparazioni. Specie ben distinta da *H. franzi*, Pace, 1985, del Venezuela, per la minore taglia e per la semplicità di forma della spermateca, non avvolta in parte a matassa come in *franzi* o come in *ecuadorica* sp. n. sopra descritta.

Etimologia. Specie dedicata al suo raccoglitore, il Dr Luca Bartolozzi del Museo Zoologico "La Specola" dell'Università di Firenze.

Thiasophila (**Apatusa** subgen. n.) (Figg. 74–80)

Il nuovo sottogenere è creato per una nuova specie *Thiasophila punchricornis* sotto descritta. E' distinto in base ai caratteri dati nella seguente chiave:

1 – Articoli dei palpi labiali più o meno di pari lunghezza; processo mesosternale stretto; primo tarsomero posteriore corto, più corto dei tarsomeri 2° e 3° considerati insieme. . . . . . . *Thiasophila (Thiasophila)* Kraatz

– Primo articolo dei palpi labiali lunghissimo, fig. 78, secondo cortissimo; processo mesosternale a punta larga; primo tarsomero posteriore più lungo dei tarsomeri 2° e 3° compresi insieme, fig. 74. . . . . *Thiasophila* (*Apatusa* subgen. n.)

TYPUS SUBGENERIS: *Thiasophila (Apatusa) pulchricornis* sp. n.

Etimologia. Il nome del nuovo sottogenere significa "Colei che trae in inganno".

Thiasophila (**Apatusa**) **pulchricornis** sp. n. (Figg. 74–80)

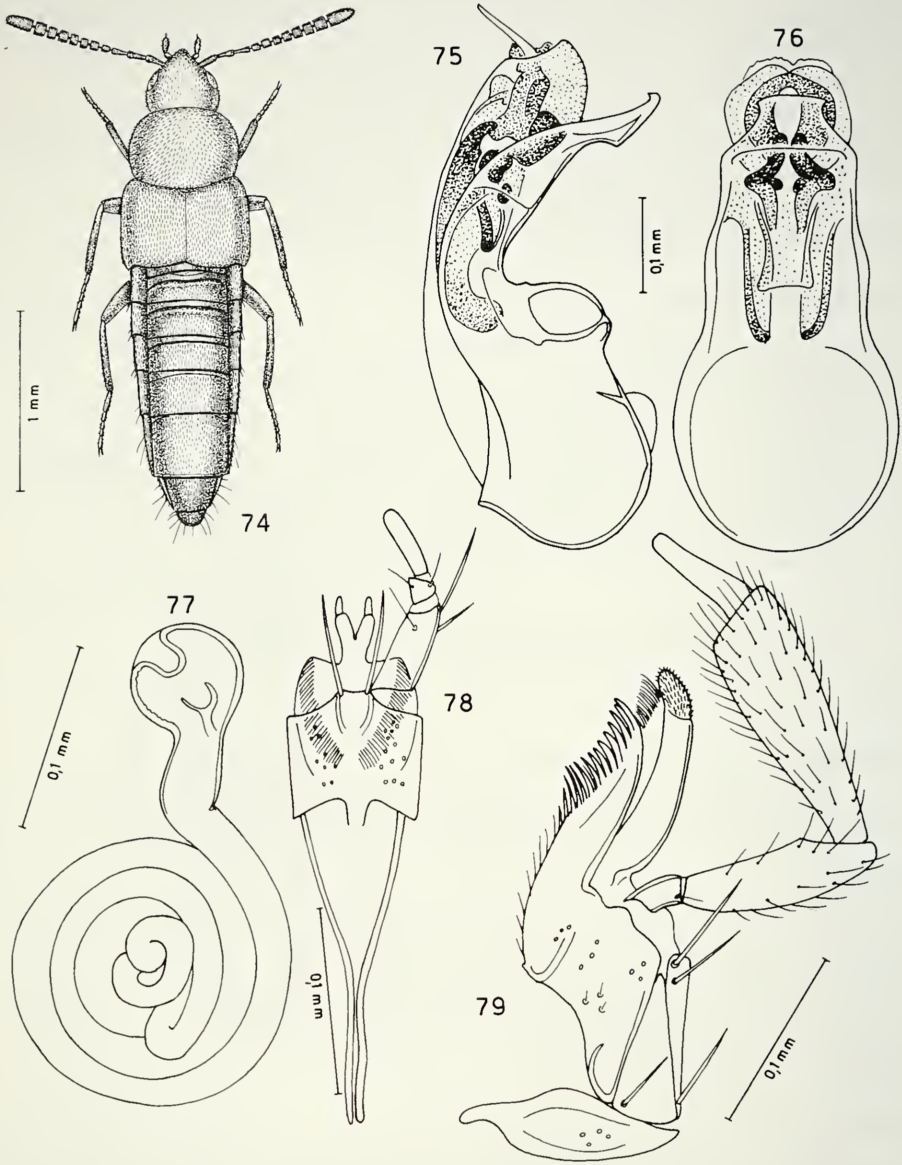
TIPI. Holotypus ♂, Nord-Kolumbien, Nördl. Sierra Nevada de Sta. Marta, San Lorenzo, 2200 m, 18–24.VIII.1985, Nadelwald, Cupressus sp. Barberfallen, (Müller leg., MG).

Paratypi: 1 ♂ e 1 ♀, stessa provenienza; 1 ♂, idem, ma in data 20.VIII.1985 e "aus Moosrasen".

Descrizione. Lunghezza 2,7 mm. Corpo lucido e bruno; antenne brune con antennomero basale giallo-bruno e l'undicesimo giallo-rossiccio chiaro; zampe bruno-rossicce con tarsi giallo-rossicci. La reticolazione del capo e del pronoto è svanita, quella delle elitre è distinta e quella dell'addome è assente. I tubercoletti che coprono la superficie del capo e del pronoto sono superficiali, quelli delle elitre sono distinti. Edeago figg. 75–76, spermateca fig. 77.

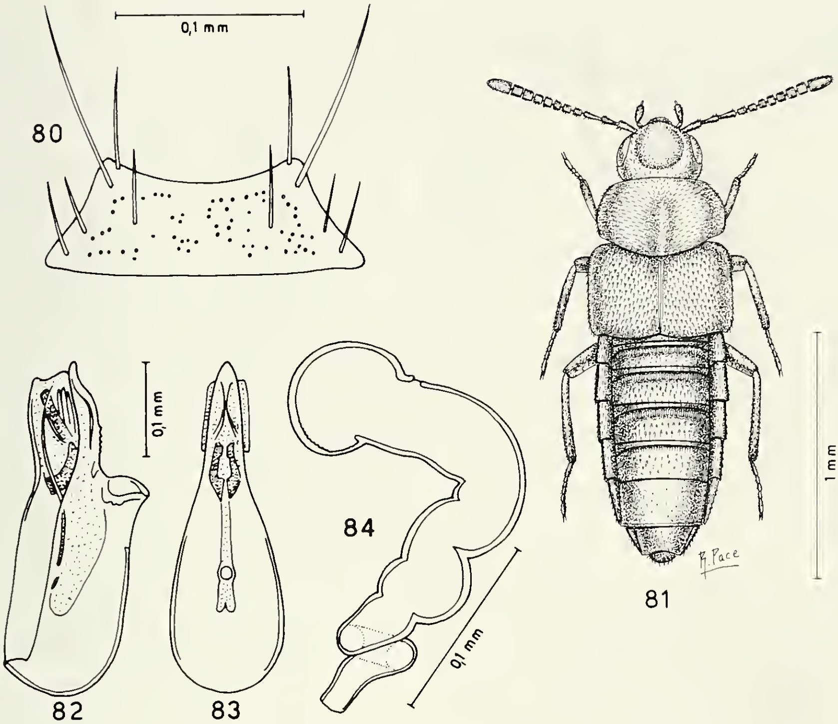
Parabainusa gen. n. (Figg. 85–90)

Habitus di *Polylobus* Solier, 1849, ma con avancorpo fittamente pubescente. Tempie distintamente marginate; palpi labiali di tre articoli: il terminale ha una papilla apicale simile a un piccolissimo articolo supplementare; ligula larga e profondamente divisa a metà, fig. 88; palpi mascellari di quattro articoli, di cui il terzo è lunghissimo fig. 89; mento come da fig. 90; processo mesosternale fuso con il processo metasternale; mesocoxe tra loro separate; formula tarsale 5–5–5; primo tarsomero posteriore lungo quanto i tre tarsomeri seguenti compresi insieme.



FIGG. 74–79

Habitus, edeago in visione laterale e ventrale, spermateca, labio con palpo labiale e maxilla con palpo mascellare. 74–79: *Thiasophila* (*Apatusa* subgen. n.) *pulchricornis* sp. n.



FIGG. 80–84

Mento, edeago in visione laterale e ventrale, spermateca e habitus. 80: *Thiasophila* (*Apatusa* subgen. n.) *pulchricornis* sp. n.; 81–84: *Tinotus frontalis* sp. n.

TYPUS GENERIS: *Parabainusa tropica* sp. n.

Etimologia. Il nome del nuovo genere significa "Colei che trasgredisce".

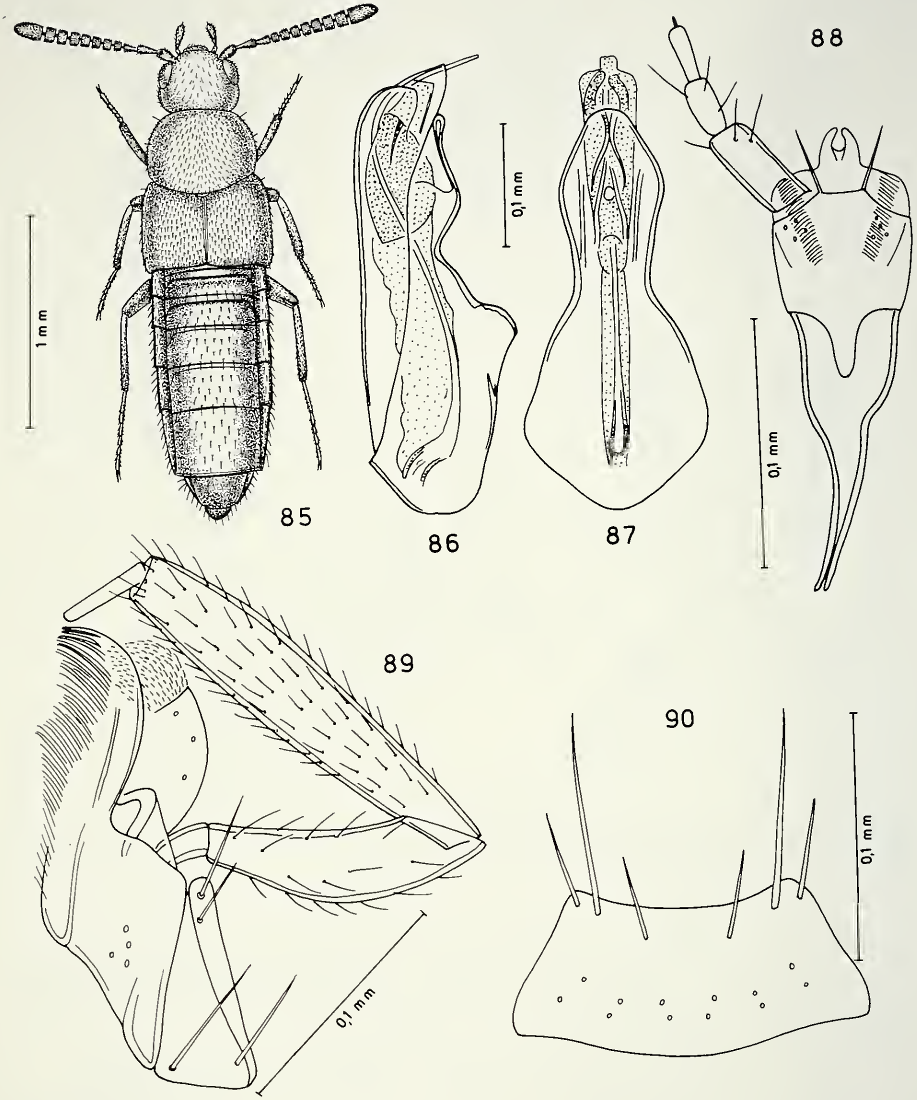
Comparazioni. Il nuovo genere è affine al genere *Polylobus* Solier, 1849. Se ne distingue per i caratteri più salienti dati nella seguente chiave:

1 – Mesocoxe contigue; processi mesosternale e metasternale separati tra loro da uno spazio più o meno ampio; paraglosse molto sporgenti in avanti, con setole lunghe. . . . . *Polylobus* Solier

– Mesocoxe separate; processi mesosternale e metasternale fusi tra loro; paraglosse non sporgenti in avanti, con setole cortissime e aderenti. . . . . *Parabainusa* gen. n.

Parabainus tropica sp. n. (Figg. 85–90)

TIPO. Holotypus ♂, Kolumbien, Punta de Betin, Sta. Marta, 1.III.1986, Barberfallen, (Müller leg., MG).



FIGG. 85–90

Habitus, edeago in visione laterale e ventrale, labio con palpo labiale, maxilla con palpo mascellare e mento. 85–90: *Parabainusa tropica* gen. n., sp. n.

Descrizione. Lunghezza 2,3 mm. Corpo lucido. Avancorpo rossiccio; addome giallo-rossiccio; antenne rossicce con antennomero basale giallo-rossiccio; zampe rossicce Il corpo è senza reticolazione. Il capo e il pronoto presentano punteggiatura fine e distinta. Tubercoletti salienti coprono la superficie delle elitre. I metatarsi sono più lunghi della corrispondente tibia. Edeago figg. 85–90.

HOPLANDRIINI

Tinotus frontalis sp. n. (Figg. 81–84)

TIPI. Holotypus ♂, Kolumbien, Villa Culebra bei Bonda, Sta. Marta, XI–XII.1985, Barberfallen, (Müller leg., MG).

Paratypi: 29 es., stessa provenienza.

Descrizione. Lunghezza 1,8 mm. Corpo lucido e rossiccio con capo bruno e addome giallo-rossiccio; antenne brune con i due antennomeri basali giallo-rossicci; zampe giallo-rossicce. Solo nel maschio, il capo presenta una larga depressione frontale coperta di fitte setoline argentee: tra esse alcune sono spatulate e riflettono la luce. Il resto della superficie del capo presenta tubercoletti e reticolazione superficiali. La reticolazione del pronoto e delle elitre è distinta. I tubercoletti della superficie del pronoto sono distinti, quelli delle elitre sono ben salienti. Gli uroterghi presentano punti allungati netti. Edeago figg. 82–83, spermateca fig. 84.

Comparazioni. La larghissima depressione frontale del maschio, coperta di fitte setoline argentee, è carattere unico che distingue la nuova specie da *T. cavicollis* Sharp, 1883 e *T. flavescens* Sharp, 1883, entrambe del Guatemala, che non mostrano tale carattere.

ALEOCHARINI

Rheochara aequatoris sp. n. (Figg. 91–93)

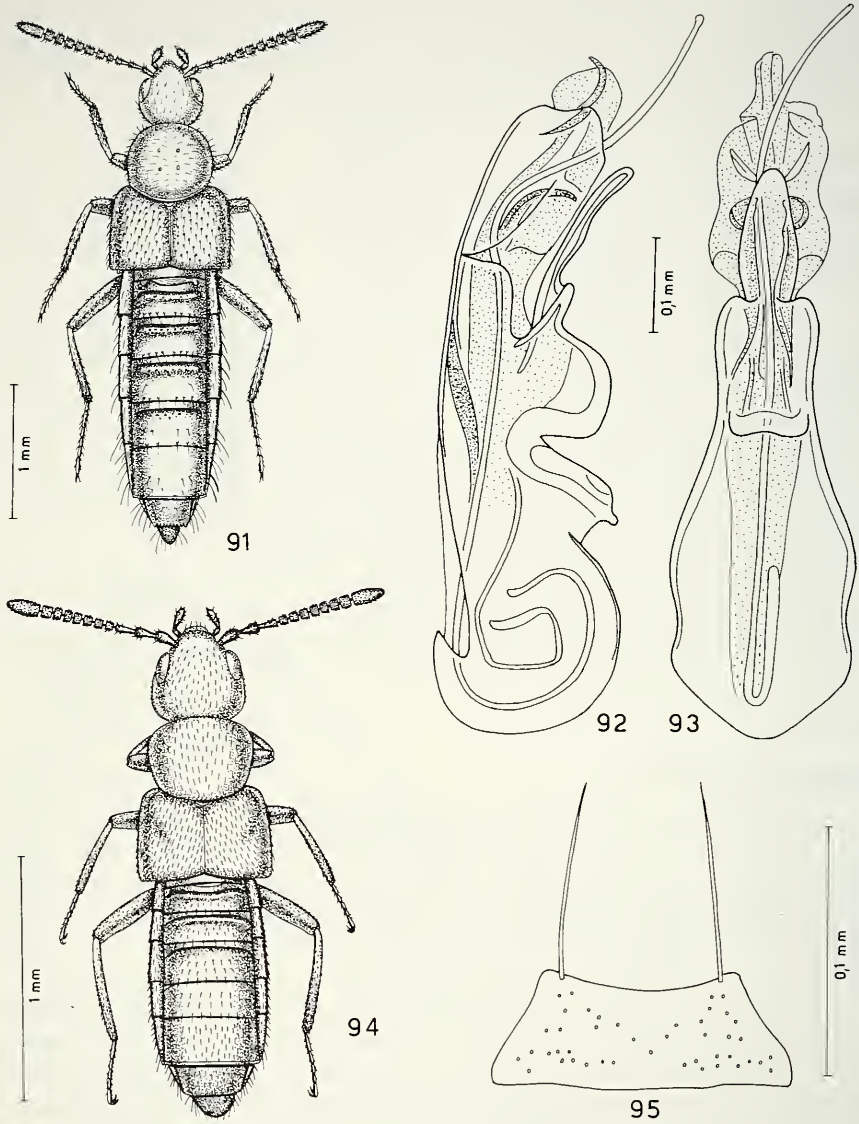
TIPO. Holotypus ♂, Ecuador, Playa Tanga b. Guayaquil, IV.1975, (H. Franz leg., CFR).

Descrizione. Lunghezza 3,8 mm. Corpo lucidissimo e nero con elitre rossicce; antenne brune con i due antennomeri basali, la base del terzo e la metà apicale dell'undicesimo rossicci; zampe brune con tarsi rossicci. Sul corpo non vi è traccia di reticolazione. La punteggiatura del capo è distinta, quella del pronoto è fine e netta e quella delle elitre è scabra e netta. Edeago figg. 92–93.

Comparazioni. Specie distinta da *R. disjuncta* Casey, 1900, della California, per la maggiore taglia (3,8 mm, invece di 3,0 mm), per essere priva di reticolazione (finemente reticolata la specie *disjuncta*), per l'addome non percorso da strie trasverse come in *disjuncta*, per le elitre lunghe quanto il pronoto e non molto più lunghe come in *disjuncta*, cioè con sutura molto più corta della linea mediana del pronoto e non circa un terzo più lunga, come si osserva in *disjuncta*.

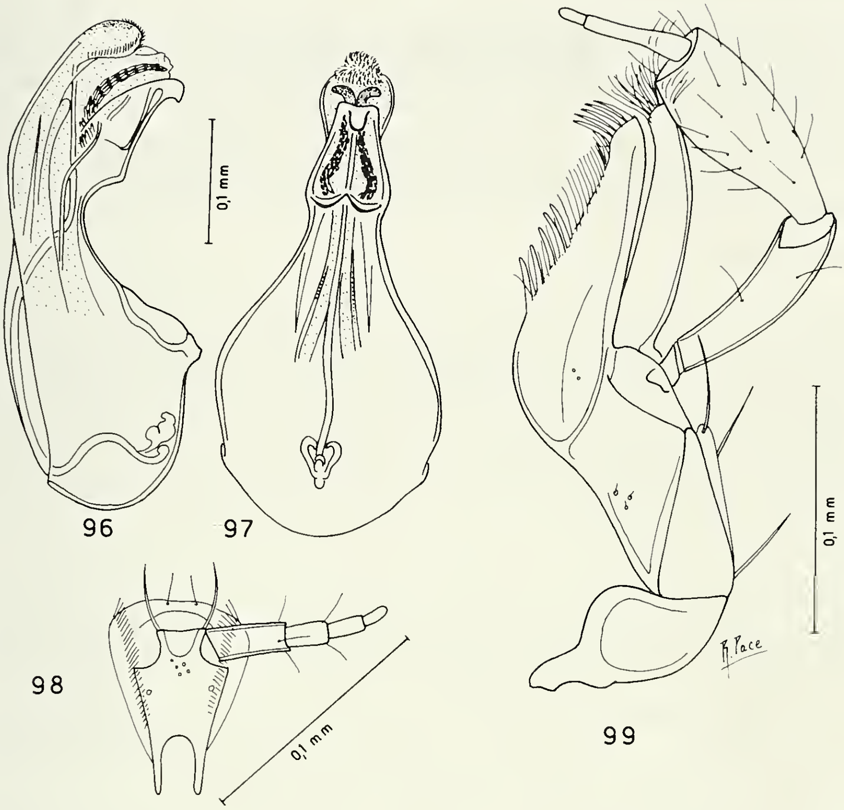
Eydelusa gen. n. (Figg. 94–99)

Habitus che ricorda il genere *Amischa* Thomson, 1858. Tempie non marginate; palpi labiali di quattro articoli; ligula nulla, fig. 98; mento come da fig. 95; palpi mascellari di cinque articoli, fig. 99; proceso mesosternale largo e tronco, sicché le



FIGG. 91–95

Habitus, edeago in visione laterale e ventrale e mento. 91–93: *Rheochara aequatoris* sp. n.; 94–95: *Eydelusa bartolozzii* gen. n., sp. n.



FIGG. 96–99

Edeago in visione laterale e ventrale, maxilla con palpo mascellare e labio con palpo labiale. 96–99: *Eydelusa bartolozzi* gen. n., sp. n.

mesocoxe sono largamente separate tra loro; formula tarsale (5?)–5–5 (i tarsi anteriori sono andati perduti probabilmente in fase di raccolta: la presenza di palpi labiali di 4 articoli e di palpi mascellari di 5 articoli permette di affermare senza gravi dubbi che gli articoli dei tarsi anteriori sono 5); primo tarsomero posteriore lungo quanto i due seguenti compresi insieme.

TYPUS GENERIS: *Eydelusa bartolozzii* sp. n.

Etimologia. Il nome del nuovo genere significa "Colei che è evidente".

Comparazioni. Nella fauna delle Aleocharinae neotropiche o neartiche non esistono generi affini al nuovo. D'altronde, vista la particolare ecologia della specie, cioè essa vivendo su epifite di lauracee, il nuovo genere probabilmente ha una nicchia ecologica del tutto specializzata, mai fino ad ora indagata,

Eydelusa bartolozzii sp. n. (Figg. 94–99)

Tipi. Holotypus ♂, Ecuador, Cotopaxi, S. Francisco de Las Pampas, 1300–1500 m, II.1993, su epifite di Lauracee, (L. Bartolozzi leg., N° 9824, MF).

Descrizione. Lunghezza 2,0 mm. Corpo lucido e nero; antenne nere con antennomero basale bruno e il secondo nero-bruno; zampe giallo-rossicce infoscate. La reticolazione del capo e dell'addome è ben distinta, quella del pronoto e delle elitre è svanita. I tubercoletti che coprono la superficie del capo, del pronoto e dell'addome sono poco evidenti, quelli delle elitre sono indistinti. Edeago figg. 96–97.

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Contribution to the knowledge of the group *europaeus* of *Centromerus* Dahl (Linyphiidae, Araneae) in the Balkan Peninsula

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Contribution to the knowledge of the group *europaeus* of *Centromerus* Dahl (Linyphiidae, Araneae) in the Balkan Peninsula. - The study of a large sample of the blind representative of *Centromerus* Dahl (Linyphiidae, Araneae), including both sexes, has revealed that this taxon, otherwise inhabiting the Zlotska Pećina Cave, East Serbia, ex-Yugoslavia, is close to *C. dacicus* Dumitrescu and Georgescu, from Romania; therefore, it is not conspecific neither with *Centromerus europaeus* (Simon), nor with *C. subcaecus* Kulczynski, as claimed by some early araneologists. In addition, both taxonomic and biogeographical interrelationships of some representatives of the *C. europaeus* species group in the Balkan Peninsula have been discussed in view of the genesis and evolution of their underground habitats.

Key-words: taxonomy - biogeography - evolution - cave fauna - Araneae - *Centromerus*.

INTRODUCTION

Records of cave-dwelling spiders in Serbia (ex-Yugoslavia) are rare and consist of brief reports by STOJIĆEVIĆ (1929), ČURČIĆ (1969) and DEELEMAN-REINHOLD (1985), who cite altogether 22 species, classified into 15 genera and 11 families; representatives of these species are mostly either regular trogloxenes, troglophilic or epigean forms. The only troglobitic spider from the area belongs to the genus *Centromerus* Dahl; its representatives were found in the Zlotska Pećina Cave and in the Vernjikica Pećina Cave, East Serbia, ex-Yugoslavia (FAGE 1931; KRATOCHVIL & MILLER 1938; THALER 1987). Subsequently, a long-lasting confusion concerning the taxonomic status of this taxon was due mainly to the fact that all further revisions of the blind *Centromerus* species from Serbia were based only on females.

We propose to analyse the diagnostic characters of this troglobitic species and to offer some evidence on its taxonomic and evolutionary interrrelationships with other spiders of the *C. europaeus* species group in the Balkan Peninsula.

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MATERIAL AND METHODS

30 ♀, 4 ♂ and 30 juveniles of the blind *Centromerus* are analysed from the Zlotska Pećina Cave (or Lazareva Pećina Cave), village of Zlot, near Bor, East Serbia, ex-Yugoslavia, 21–23 November 1995, collected by R.N. Dimitrijević, S.E. Makarov, and L.R. Lučić. In the same cave, a male and a female of the troglophilic linyphiid species *Lepthyphantes trnovensis* (Drensky) were also discovered.

Used abreviations: E – embolus; m – membrane; LR – lamellar part of radix; R – radix; O – genital openings; P – paracymbium; S – genital socket; T – terminal apophysis.

All specimens are preserved in 75% ethyl-alcohol with 5% glycerol. One male and three females are deposited in the collection of the Muséum d'histoire naturelle in Geneva, Switzerland; all other specimens are deposited in the collection of the Institute of Zoology, Faculty of Biology, University of Belgrade, Belgrade, Yugoslavia.

RESULTS AND DISCUSSION

The taxonomic identity of the blind *Centromerus* female from the Zlotska Pećina cave had attracted the attention of numerous araneologists (DRENSKY 1931; KRATOCHVIL 1934, 1936; KRATOCHVIL & MILLER 1938; THALER & HÖFER 1988); the uncertain status of this species is due to two facts: (a) only females were accessible for comparison and (b) the distinctions between females of the species of the *C. europaeus* group are not reliable.

Following FAGE (1931), KRATOCHVIL (1934) attributed the *Centromerus* specimens from the Zlot cave system to *Centromerus europaeus* (Simon), which otherwise inhabits the Maritime Alps and the Pyrenees (SIMON 1911, 1929); the findings of the latter form in Algeria are doubtful, since BOSMANS (1986) claimed that the exact identity of *C. europaeus* (and especially of the specimens from Algeria) was uncertain. Furthermore, he also considered the possibility of erroneous attribution of other Algerian species to *C. europaeus*, and especially of those with either reduced eyes or with no eyes at all (BOSMANS 1986). Additionally, early araneologists simply attributed numerous anophthalmous specimens of *Centromerus* to *C. europaeus*, without considering the distinctions in the structure of the male pedipalp and epigyne, which otherwise exist between different populations and species.

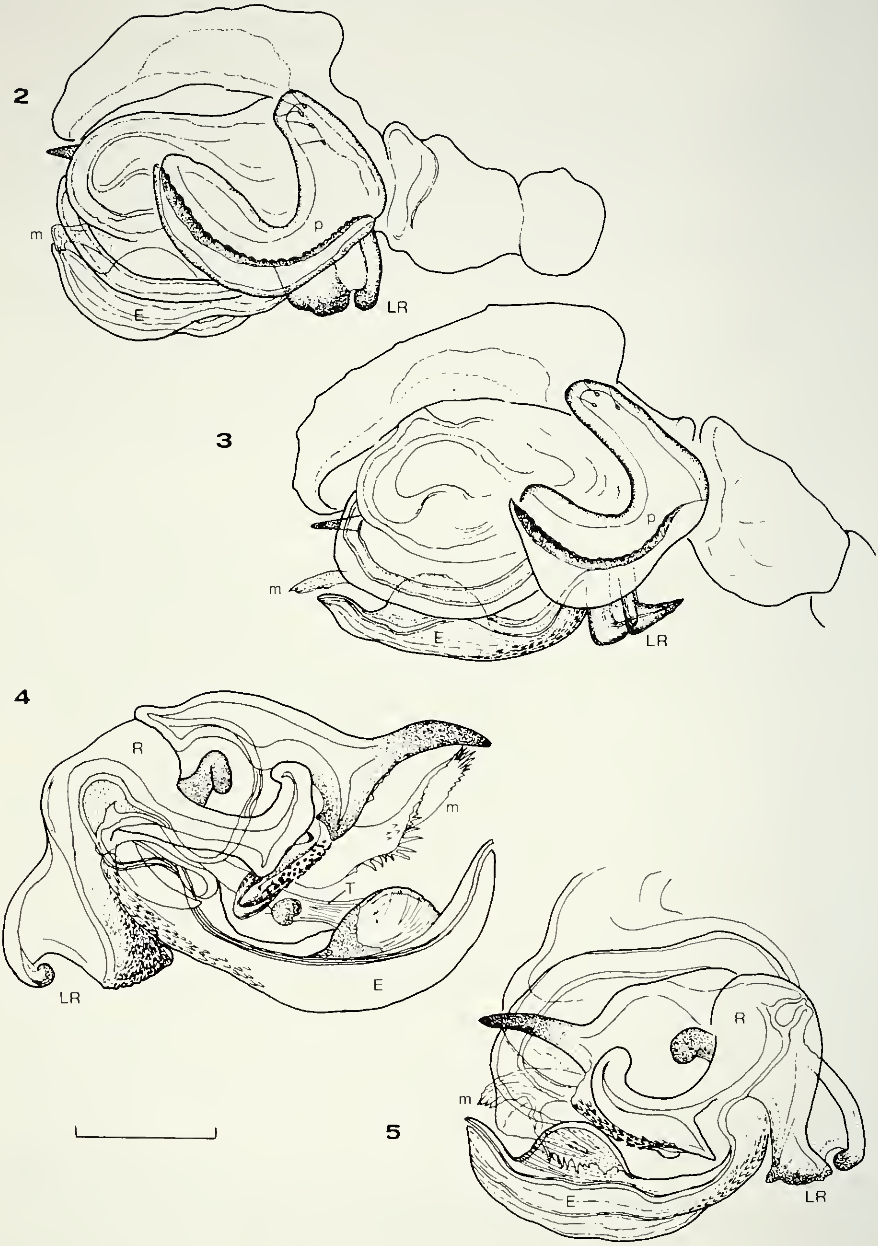
Subsequently, KRATOCHVIL (1936) and KRATOCHVIL & MILLER (1938) reconsidered the status of some Centromerus representatives from different caves of the Balkan Peninsula.

On that occasion, they identified the Zlot cave *Centromerus* as *subcaecus* Kulczynski, the type of which (a single female) was collected in a cave near Trebinje, Hercegovina (KULCZYNSKI 1914). KRATOCHVIL & MILLER (1938) re-studied this type specimen and some males and females of this species, collected from two caves situated at a distance of 10 and 35 km from the type-locality. Therefrom they described a male of *C. subcaecus* and mentioned the species from 8 caves in Hercegovina, Montenegro and Serbia (Zlotska Pećina Cave). This conclusion was further

FIG. 1

Geographical distribution of *Centromerus subcaecus* Kulczynski (solid triangle), *C. bulgarianus* (Drensky) (solid square), *C. dacicus* Dumitrescu and Georgescu (solid circle), and *C.* prope *dacicus* Dumitrescu and Georgescu (open circle).

supported by L. Fage who personally had re-studied the specimens of *C. subcaecus*, upon the demand of Kratochvil; therefore, the former author also considered the Zlot *Centromerus* as conspecific with Kulczynski's species (KRATOCHVIL & MILLER 1938). However, all these comparisons were based on females only.



Figs 2–5. - 2, *Centromerus* prope *dacicus* Dumitrescu & Georgescu, male palp, external view (Zlotska Pećina Cave, Serbia); 3, *C. bulgarianus* (Drensky), male palp, external view (Suhata Pestera Cave, Bulgaria); 4, *C. dacicus* Dumitrescu & Georgescu, suprategulum and embolic devision, dorsal view (Closani Cave, Romania) (Dumitrescu & Georgescu 1980); 5, *C.* prope *dacicus* Dumitrescu & Georgescu, suprategulum and embolic devision, dorsal view (Zlotska Pećina Cave, Serbia). Scale line 0.10 mm, (2, 3, 5). Fig. 4 is taken from Dumitrescu & Georgescu 1980 (no scale line).

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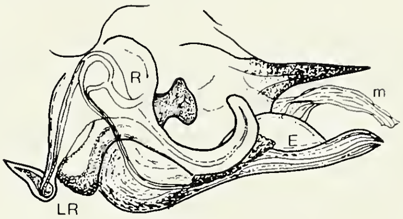

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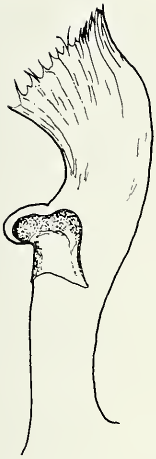

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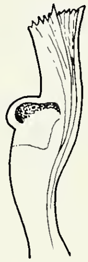

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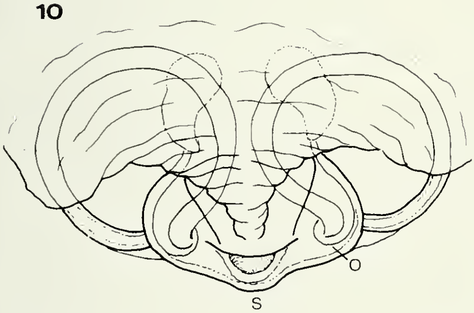

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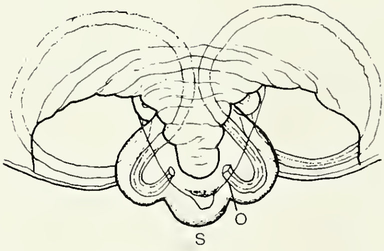

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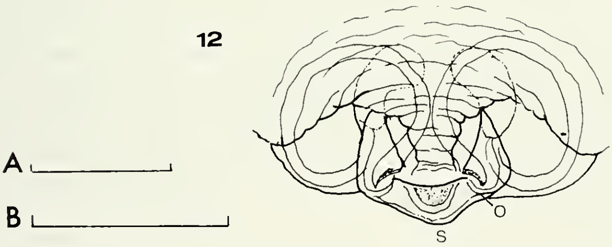

FIGS 6–12. - 6, Centromerus *bulgarianus* (Drensky), suprategulum and embolic devision (Suhata Pestera Cave, Bulgaria); 7, *C. dacicus* Dumitrescu & Georgescu, terminal apophysis (Closani Cave, Romania) (DUMITRESCU & GEORGESCU 1980); 8, *C.* prope *dacicus* Dumitrescu & Georgescu, terminal apophysis (Zlotska Pećina Cave, Serbia); 9, *C. bulgarianus* (Drensky), terminal apophysis (Suchata pestera Cave, Bulgaria); 10, *C.* prope *dacicus* Dumitrescu & Georgescu, vulva and epigyne (Zlotska Pećina Cave, Serbia); 11, *C. dacicus* Dumitrescu & Georgescu, vulva and epigyne (Closani Cave, Romania) (DUMITRESCU & GEORGESCU 1980); 12, C. bulgarianus (Drensky), vulva and epigyne (Suchata Pestera, Bulgaria). Scale line 0.10 mm (6, 8, 9, 10, 12). Figs 7, 11 is taken from DUMITRESCU & GEORGESCU 1980 (no scale line).

Further females from the Vernjikica Cave, from the vicinity of the Zlotska Pećina Cave, were announced by THALER & HÖFER (1988), who identified the specimens as close to *C. subcaecus*.

Actually, in 1995, the junior author came in the possession of a lot of the blind *Centromerus* from the Zlot cave which comprised specimens of both sexes. A thorough analysis of a number of morphological traits has clearly shown that this form is close to *C. dacicus* Dumitrescu and Georgescu, the latter being established from a number of caves and potholes in the Closani area, Oltenia, Romania (DUMITRESCU & GEORGESCU 1980). Subsequently, a detailed comparison between the two taxa has enabled us to consider the Zlot species as *C.* prope *dacicus*, since the two forms are phenetically similar. However, there still exist some clear differences between *C. dacicus* and *C.* prope *dacicus* in the lamellar part of the radix and terminal apophysis as well as in the form of the epigyne (Figs 2–12).

In addition, both *C. dacicus* and *C.* prope *dacicus* differ significantly from *C. bulgarianus* (Drensky), otherwise inhabiting only two caves in western Bulgaria (Figs 1–12) (DRENSKY 1931; DELTSHEV 1972). These three species, as well as *C. subcaecus*, belong to the *europaeus*-group of the genus *Centromerus* in the Balkan Peninsula. All these taxa are phenetically similar, they have limited ranges and, probably, represent the descendants of a common ancestor; it is assumed that this ancestral form is no longer present in the epigean fauna and that it must have been replaced by modernised *Centromerus* (Deeleman-Reinhold 1976).

One more item is worthy mentioning. The Zlotska Pećina Cave is located on the slopes of Mt. Kučaj, on the left bank of the Lazareva Dolina, representing the deepest and the narrowest canyon in East Serbia (PETROVIĆ 1958). The specimens of *C.* prope *dacicus* were found in deep, humid, and dark channels of the cave, usually under stones. The life cycle of this species is well established in the cave; additionally, this form is the only true troglobitic spider, known to date from East Serbia. Apart from *C.* prope *dacicus*, over 20 different endemic and relict invertebrates (copepods, isopods, pauropods, diplopods, pseudoscorpions, spiders, springtails, diplurans, thysanurans, and coleopterans) inhabit the Zlotska Pećina Cave. Such richness of the fauna inhabiting this cave has been largely affected by the outstanding variety of the once existing epigean fauna, by the process of karstification (and the eventual evolution of the subterranean karst relief), and by the divergent differentiation of species in isolated subterranean habitats. These species and genera represent the last vestiges of an old fauna, which found their last shelter in the underground domain of the Balkan Peninsula (ČURČIĆ 1986, 1988, 1995).

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REVUE SUISSE DE ZOOLOGIE 104 (1): 57-60; mars 1997

Cryptocephalus (Homalopus) loebli n. sp. from Turkey (Coleoptera Chrysomelidae Cryptocephalinae)

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Cryptocephalus (Homalopus) loebli **n. sp. from Turkey (Coleoptera Chrysomelidae Cryptocephalinae).** – *Cryptocephalus loebli* sp. n. is described from Turkey. It belongs to the subgenus *Homalopus* Chevrolat and is closely related to *C. informis* Suffrian, from which it differs by the shape of the aedeagus and in female by the pronotum more extensively yellowish.

Key-words: New species - Coleoptera - Chrysomelidae - *Cryptocephalus* - *Homalopus* - Turkey.

Thanks to the kindness of Dr I. Löbl I had the opportunity to study a small sample of Cryptocephalinae from Tnrkey, mostly collected by Dr C. Besuchet and Dr I. Löbl. Among them I have found a species new to science, described in the present paper. The type material is deposited in the Museum of Natural History in Geneva.

Cryptocephalus (Homalopus) loebli n. sp.

MATERIAL EXAMINED: Holotype (male) and paratype (1 female): Turkey, Bolu, Abant, 22.5.1976, 1500–1600 m, Cl. Besuchet & I. Löbl leg.

DIAGNOSIS:

A *Homalopus* of large size, very similar to *C. informis* Suffrian. Black, elytra reddish with black markings. Shape of male legs as in members of the subgen. *Cryptodontus* sensu BURLINI, 1969. First tarsal segment of fore legs symmetrical; wider than in the related *C. informis*, *C. tricolor* and *C. prusias* (figg. 1–4). Male differs from *C. informis* in the shape of the aedeagus; female in the pronotal spots subelliptical and in the anterior margin of the pronotum entirely reddish. Male differs from *C. prusias* Suffrian in having the pronotum entirely black, with lateral margins more slender and curved, and in the shape of the tibiae and the hind femora. The female is very similar to *C. tricolor* Rossi, but differs in larger size, in having the pronotum more closely punctured, with anterior and lateral margins more reddish. *Cryptocephalus loebli* differs from all the mentioned species in the shape of the aedeagus (figs 9–20).

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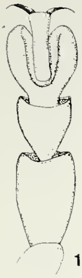

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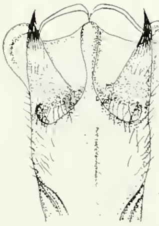

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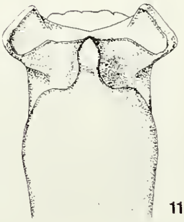

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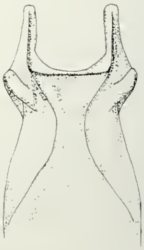

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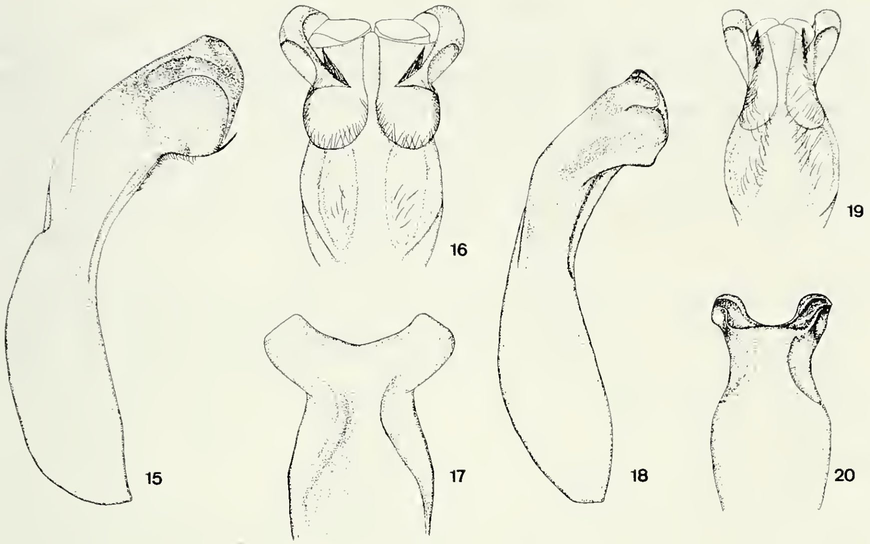

FIGS 1–4: Protarsi; 1: *C. tricolor* Rossi (Basilicata, Accettura); 2: *C. informis* Suffrian (Abruzzo, Fonte Cerreto); 3: *C. loebli* n. sp.; 4: *C. prusias* Suffrian (Bulgaria, Golo bardo). Figs 5–7: *C. loebli* n. sp.; 5: Fore tibia; 6: Middle tibia; 7: Hind femur (inner surface). Fig. 8: *C. loebli* n. sp.; Spermatheca.

FIGS 9–14: Aedeagus in lateral, ventral and dorsal view. 9–11: *C. loebli* n. sp.; 12–14: *C. prusias* Suffrian (Bulgaria, Golo bardo).

FIGS 15–20: Aedeagus in lateral, ventral and dorsal view. 15–17: *C. informis* Suffrian (Abruzzo, Fonte Cerreto); 18–20: *C. tricolor* Rossi (Basilicata, Accettura).

DESCRIPTION OF THE MALE:

Head black, with a small yellow spot at upper margin of eyes; frons feebly concave in middle, coarsely punctured; with two distinct, smooth tubercles above the clypeus; antennae pitchy brown with segments 1–3 partly reddish; second segment subglobose at apex; 3rd segment 2,5 times as long as 2nd; 3 and 4 subequal, fairly compressed; length ratio of antennal segment as: 100:40:100:120:140:140:140:120: 110:110 (last segment missing); mandibles reddish. Pronotum black, just over than 2/3 as long as broad, glabrous; disc strongly convex, fairly narrowed basally, strongly arcuate laterally; lateral margins fairly narrow, simultaneously visible in dorsal view; surface rather closely and distinctly punctured; punctures subequal in size, becoming slightly less dense on central portion of disc; background finely micropunctured. Scutellum black, obtuse and truncate on apex, as long as broad, minutely punctured. Elytra more than twice as long as broad, glabrous; with subparallel lateral edges; slightly broadened at apex, widest near middle; punctures dense, irregularly arranged; interstices completely obliterated; lateral margins moderately widened, simultaneously visible in dorsal view behind humera; colour redddish, with commissure and basal margin black; two rounded spots near base at equal distance from basal margin and a broader postmedian transverse spot, black; epipleura partly blackish. Legs black, with protibiae (fig. 5) curved, bisinuated on inner side, with a shallow, smooth and glabrous depression on inner face of apical end; inner protibial angle forming a denticle projecting forward. Mesotibiae (fig. 6) strongly curved, barely broadened distally. Metafemora (fig. 7) with large obtuse denticle on outer rim, bordering an arcuate notch; first tarsal segment of fore legs (fig. 3) symmetrical and fairly broadened. Ventral surface entirely black; anal sternite with a large and lustrous depression, which is evenly concave apically and with a T-shaped, feebly raised carina posteriorly. Aedeagus (figs 9–11) with rather squat apical processes; ventral pits shallow and transverse, not well delimited at apical margin; apex with a mediodorsal, obtuse carina.

DESCRIPTION OF THE FEMALE:

Pronotum more transverse, less convex and curved laterally; black, with two oblong-oval yellow spots centered on sides (closer to median line than to external margin); lateral and anterior margins reddish; reddish lateral margins slightly tinged with black. Legs normally shaped. Spermatheca (Fig. 8) sickle shaped; proximal part straight, forming a short projecting section at base; distal part faintly tapered towards apex; gland subtubular, without constrictions; ductus not coiled.

MEASUREMENTS OF THE SPECIMENS (in mm):

	Total length	Total width	Pronotum length	Pronotum width	Elytral length
Male	7,16	3,95	2,51	3,63	5,30
Female	8,09	4,28	2,60	3,81	5,95

LITERATURE

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REVUE SUISSE DE ZOOLOGIE, 104 (1): 61-94; mars 1997

Synopsis de la faune de scorpions de Colombie, avec des considérations sur la systématique et la biogéographie des espèces

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Synopsis of the scorpion fauna of Colombia, with some considerations on the biogeography and diversity of species. - Colombian scorpion fauna called the attention of previous arachnologists since the middle of the 19th century, however, only in the last seven year this fauna has been intensively studied by the author. This paper represents the first attempt to produce a synthesis of this fauna, however, the results presented here must be considered as only a parcel of what really exists in Colombia as scorpion fauna, and only a much larger inventory work will reveal the real importance of the total number of taxa present in this country. At the present stage of the studies conducted since 1988, a total number of 4 families (Buthidae, Chactidae, Diplocetridae and Ischnuridae) with 9 genera and 41 species can be confirmed for the country. Some comments on the biogeography and diversity of this fauna are also added.

Key-words: Scorpions - Colombia - Taxonomy - Biogeography - Diversity.

INTRODUCTION

La faune des Scorpions de Colombie, de par sa grande complexité et sa richesse, a très tôt attiré l'attention des chercheurs du 19è siècle tout d'abord avec le travail pionnier de GERVAIS (1844), suivi par plusieurs autres, en particulier, THORELL (1876), POCOCK (1893) et KRAEPELIN (1912, 1914). Dans son travail global sur la faune sud-américaine, MELLO-LEITÃO (1945) synthétise les connaissances existantes à l'époque sur cette faune. Son travail constitue une sorte de conclusion à toute une période d'étude. Suite à ce travail, on assiste à une espèce de phase statique sans aucune contribution majeure à la faune des Scorpions de Colombie, avec une exception, peut-être: la modeste contribution locale proposée par PAZ (1978), qui manque cependant de toute la rigueur scientifique nécessaire.

Dès les années 1980, des essais de révisions, au moins partiels, sont proposés par LOURENÇO (1984a, b), mais c'est à partir d'un programme d'études sur le terrain initié par cet auteur en 1988, qu'un progrès considérable dans l'étude de cette faune a

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été réalisé, avec un nombre grandissant de contributions (Lourenço 1991a, 1993, 1994a, 1995a, b; Lourenço & Florez 1989, 1990a, b, 1995).

L'objectif de la présente note est d'apporter une synthèse des espèces connues, tout en sachant que l'ensemble des éléments est loin d'être inventorié, mais cela permet néanmoins de clarifier divers points obscurs encore existants dans la systématique du groupe (Lourenço 1995c). Les spécimens signalés sont déposés dans les collections du Muséum d'histoire naturelle de Genève.

LISTE CRITIQUE DES SCORPIONS COLOMBIENS

Les taxa de même rang sont indiqués par ordre alphabétique et leur traitement dans le texte suit la même séquence.

Famille des Ischnuridae Pocock, 1893

- Genre *Opisthacanthus* Peters, 1861
  - *Opisthacanthus elatus* (Gervais, 1844)

Famille des Diplocentridae Peters, 1861

- Genre *Tarsoporosus* Francke, 1978
  - *Tarsoporusus klugeri* (Schenkel, 1932)
  - *Tarsoporosus anchicaya* Lourenço & Florez, 1990

Famille des Buthidae Simon, 1880
- Genre *Ananteris* Thorell, 1891
  - *Ananteris columbianus* Lourenço, 1991
  - *Ananteris ehrlichi* Lourenço, 1994
  - *Ananteris gorgonae* Lourenço & Florez, 1989
- Genre *Centruroides* Marx, 1889
  - *Centruroides gracilis* (Latreille, 1804)
  - *Centruroides margaritatus* (Gervais, 1841)?
- Genre *Rhopalurus* Thorell, 1876
  - *Rhopalurus laticauda* Thorell, 1876
- Genre *Tityus* Koch, 1836
  - *Tityus asthenes* Pocock, 1893
  - *Tityus bastosi* Lourenço, 1984
  - *Tityus betschi* Lourenço, 1992
  - *Tityus blanci* Lourenço, 1994
  - *Tityus charalaensis* Mello-Leitão, 1940
  - *Tityus columbianus* (Thorell, 1876)
  - *Tityus cuellari* Lourenço, 1994
  - *Tityus engelkei* Pocock, 1902
  - *Tityus festae* Borelli, 1899
  - *Tityus forcipula* (Gervais, 1844)

Tityus fuhrmanni Kraepelin, 1914
Tityus lourençoi Florez, 1995
Tityus macrochirus Pocock, 1897
Tityus nematochirus Mello-Leitão, 1940
Tityus pachyurus Pocock, 1897
Tityus rebierei sp. n.
Tityus sabineae Lourenço, 1994
Tityus sastrei Lourenço & Florez, 1990
Tityus tayrona Lourenço, 1991

Famille des Chactidae Laurie, 1896

- Genre *Brotheas* Koch, 1843
  - *Brotheas camposi* Gonzalez-Sponga, 1972
- Genre *Chactas* Gervais, 1844
  - *Chactas aequinoctialis* (Karsch, 1879)
  - *Chactas barravierai* sp. n.
  - *Chactas brevicaudatus* (Karsch, 1879)
  - *Chactas brownelli* sp. n.
  - *Chactas chrysopus* Pocock, 1893
  - *Chactas hauseri* sp. n.
  - *Chactas karschi* Pocock, 1893 nec. *Chactas lepturus* Karsch, 1879
  - *Chactas lepturus* Thorell, 1878
  - *Chactas mauriesi* Lourenço & Florez, 1990
  - *Chactas oxfordi* Gonzalez-Sponga, 1978
  - *Chactas reticulatus* Kraepelin, 1912
  - *Chactas vanbenedeni* Gervais, 1844
- Genre *Teuthraustes* Simon, 1878
  - *Teuthraustes guerdouxi* Lourenço, 1995

FAMILLE DES ISCHNURIDAE

GENRE *Opisthacanthus*

Opisthacanthus elatus (Gervais, 1844) (Figs 1, 2, 11)

Cette espèce est la seule du genre connue pour la Colombie, étant également distribuée jusqu'à Panama et peut-être même au Costa Rica.

Depuis plus d'un siècle, une confusion de nomenclature a existé à propos du véritable nom de l'espèce d'*Opisthacanthus* de Colombie et de Panama, pour laquelle on a également suggéré une population disjointe dans l'île de Hispaniola. Antérieurement à la description de *O. elatus* par GERVAIS, un autre nom, *lepturus*, a été attribué par PALISOT DE BEAUVOIS (1805) à une population de l'Amérique méridionale. L'espèce *O. lepturus*, souvent ignorée par la plupart des auteurs qui ont suivi a été néanmoins rétablie par LOURENÇO (1985). Des études plus approfondies sur cette question ont cependant amené cet auteur (LOURENÇO 1995) à séparer de manière définitive les populations de Colombie/Panama et Hispaniola en deux espèces. La population de Hispaniola correspondant ainsi à *O. lepturus* et celle de Colombie/ Panama à *O. elatus*.

MATÉRIEL: Colombie, Dept. Boyaca, Otanche-Muzo, IV/1986 (Indien Mine-Muzo); 5 mâles, 3 femelles. Dept. Darien (frontera con Panama), 12/VIII/1983 (E. Mendez), 1 femelle. Dept. Huila, Gigante, II/1985 (J.P. Thelot), 1 mâle.

FIGS 1-4

1 et 2. *Opisthacanthus elatus*, mâle et femelle. 3. *Tarsoporosus anchicaya*, femelle. 4. *Centruroides gracilis*, femelle avec portée.

FAMILLE DES DIPLOCENTRIDAE

GENRE *Tarsoporosus*

Tarsoporosus klugeri (Schenkel, 1932)

Espèce décrite de l'Etat de Falcon au Venezuela et placée à l'origine dans le genre Diplocentrus. Elle est tranférée dans le nouveau genre *Tarsoporosus* par FRANCKE (1978). Ce nouveau genre demeure monotypique jusqu'à la découverte d'une seconde espèce *Tarsoporosus anchicaya* par LOURENÇO & FLOREZ (1990a). Cette espèce habite des régions semi-arides du Venezuela et de Colombie. En Colombie elle est retrouvée dans les Départements de Cesar et Guajira.

Au cours de la présente étude aucun matériel supplémentaire n'a été éxaminé.

Tarsoporosus anchicaya Lourenço & Florez, 1990 (Fig. 3)

Cette espèce est globablement très semblable morphologiquement à *T. klugeri*. Pour cette raison lors de sa découverte à Anchicaya, dans la région pacifique de Colombie, nous avons hésité à la décrire tout de suite comme une nouvelle espèce. Ainsi nous avons proposé initialement une sous-espèce *T.k. anchicaya*. Il s'avère néanmoins que la région de distribution de cette deuxième espèce est constituée de forêts humides, milieu profondément différent de celui où habite *T. klugeri*. Suite à la découverte d'un plus grand nombre d'exemplaires, des caractères permettant une distinction plus facile entre les deux espèces (formule du nombre d'épines du tarse II des pattes et structure des carènes submédianes ventrales du metasoma), ont pu être établis (LOURENÇO & FLOREZ, 1995). Ainsi, les deux espèces ont pu être séparées définitivement.

MATÉRIEL: Colombie, Dept. valle del Cauca, Anchicaya (forêt humide), 15/II/1988 (E. Florez), 1 femelle paratype. Bahia de Malaga, Playa Sande (sous bois pourri), 15/X/1989 (E. Florez), 2 femelles paratypes).

FAMILLE DES BUTHIDAE

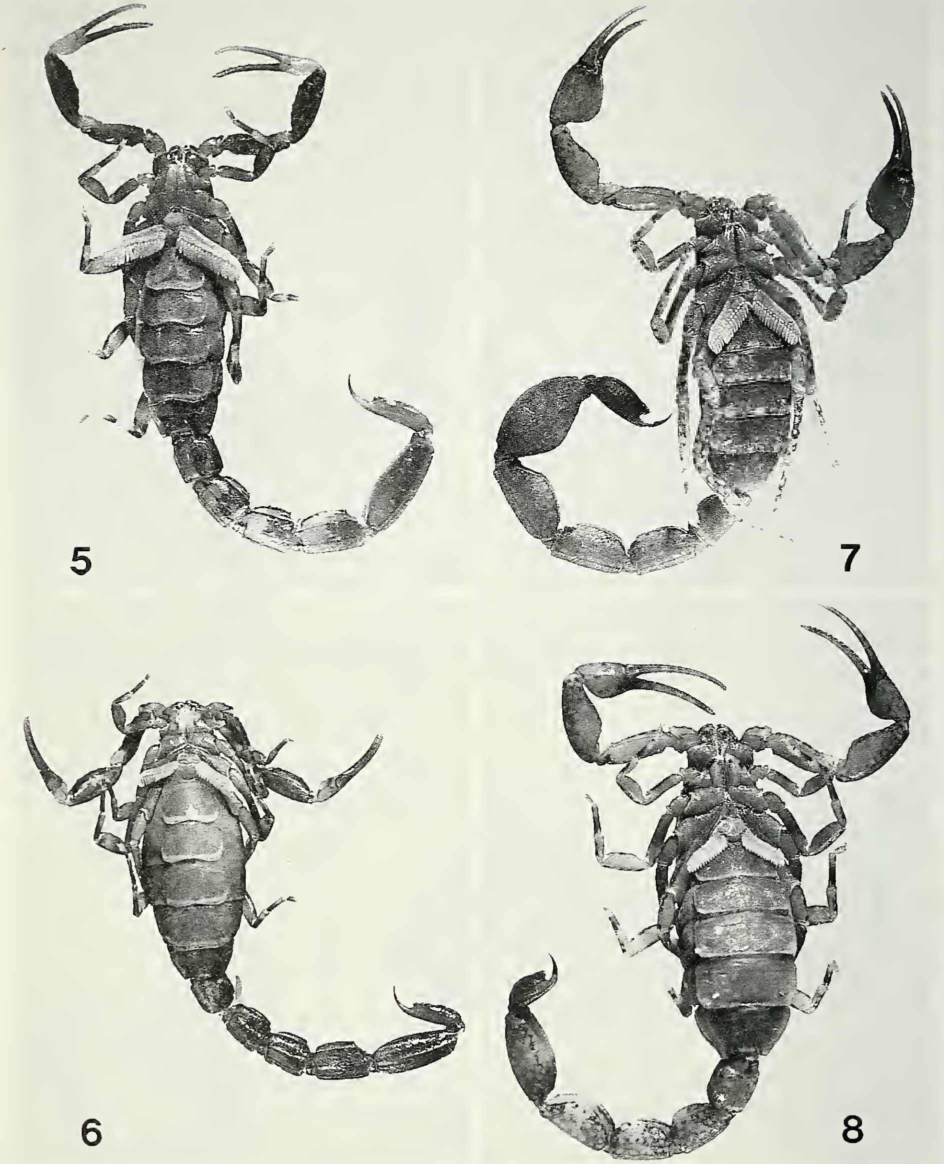
GENRE *Ananteris*

Ananteris columbianus Lourenço, 1991 (Figs 5, 6)

Espèce décrite de la région de Santa Marta, Bahia de Guairaca, P.N. Tayrona. L'espèce est de toute évidence endémique de cette région. Au cours de la présente étude aucun matériel supplémentaire n'a été examiné.

Ananteris ehrlichi Lourenço, 1994

Cette espèce connue uniquement d'après l'holotype femelle a été décrite de Vereda El Paraiso, Dept. Caqueta, dans une région périamazonienne. Comme cela s'avère être le cas de la presque totalité des espèces d'*Ananteris*, cette espèce est probablement endémique pour cette région.



FIGS 5-8

5 et 6. *Ananteris columbianus*, mâle et femelle. 7 et 8. *Tityus tayrona*, mâle et femelle. Observer l'absence de fulcres dans le peignes de *A. columbianus*.

Ananteris gorgonae Lourenço & Florez, 1989

Cette espèce décrite initialement de l'île de Gorgona se trouvant face à la côte pacifique du Département Cauca, a été par la suite découverte sur le continent. Sa répartition semble néanmoins être limitée à cette région de Colombie. Au cours de la présente étude aucun matériel supplémentaire n'a été étudié.

GENRE *Centruroides*

Centruroides gracilis (Latreille, 1804) (Figs 4, 13)

Cette espèce très ancienne est retrouvée dans plusieurs localités de la région occidentale de Colombie, en général dans des milieux arides, parfois enclavés dans des régions à forêt humide.

Lors d'une révision des *Centruroides* d'Amérique du Sud, SISSOM & LOURENÇO (1987) ont estimé les deux espèces présentes en Amérique du Sud, *Centruroides gracilis* et *Centruroides margaritatus* (Gervais, 1841) comme valables. Le problème est cependant loin d'être complètement résolu, car ces deux espèces supposées, présentent des gradients de polymorphisme évidents et pourraient constituer des morphes d'une espèce unique. Cette position a été davantage renforcée lorsque des hybridations ont été obtenues au laboratoire à partir de spécimens de Colombie et du Mexique (LOURENÇO 1991b). Pour le moment il nous semble plus prudent de considérer les populations de Colombie comme appartenant à l'espèce *C. gracilis*.

MATÉRIEL: Colombie, Dept. Valle, Lobo Guerrero, 22/II/1988 (W.R. Lourenço), 18 mâles, 12 femelles. Buga-Tulua, 18/II/1988 (W.R. Lourenço), 19 mâles, 16 femelles.

GENRE *Rhopalurus*

Rhopalurus laticauda Thorell, 1876 (Figs 9, 10, 12, 14, 15)

Espèce décrite de Colombie, et également répartie au Venezuela. Cette espèce est distribuée exclusivement sur des formations de type savanicole. En Colombie elle est retrouvée dans les Llanos de la région orientale. D'un point de vue taxonomique l'espèce a déjà été bien caractérisée dans des publications antérieures (cf. LOURENÇO 1982, 1991a).

MATÉRIEL: Colombie, Dept. Arauca (cerca frontera con Venezuela), 15/XI/1977 (L. Vasquez), 7 mâles, 10 femelles. Dept. Casanare, région de Trinidad, 6/IX/1985 (B. Xavier), 4 mâles, 3 femelles.

GENRE *Tityus*

Tityus asthenes Pocock, 1893 (Figs 16, 17)

Espèce déjà traitée lors de la publication de la faune de l'Equateur (LOURENÇO 1995c). Espèce de grande taille à couleur sombre habitant les forêts humides. Sa distribution va de l'Equateur jusqu'au Costa Rica. Les populations locales présentent une variabilité morphologique d'ordre morphométrique correspondant à un type de polymorphisme non encore bien défini. En Colombie cette espèce est répartie sur la côte pacifique.

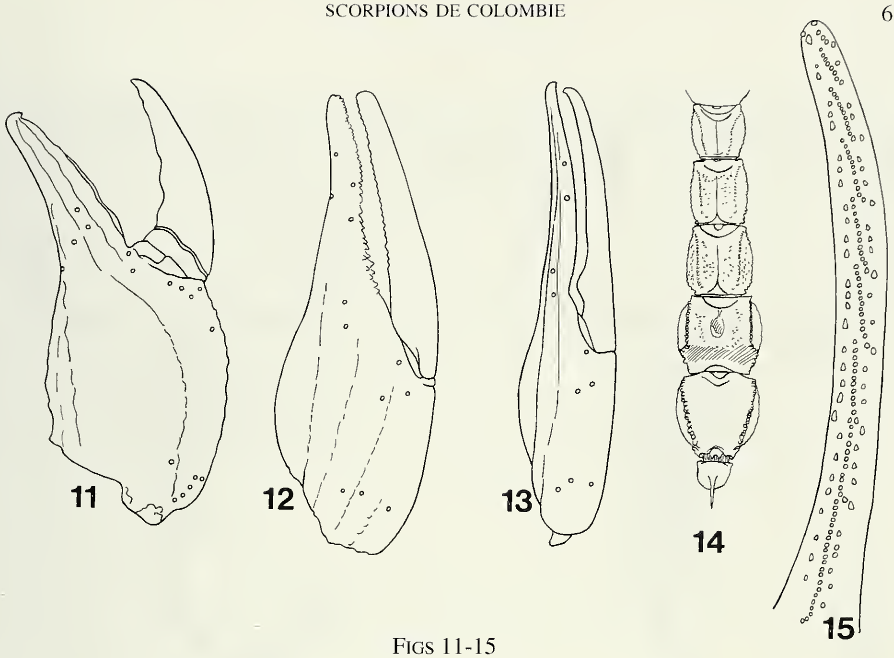
Au cours de la présente étude aucun matériel supplémentaire n'a été examiné.

Figs 9 et 10

Rhopalurus laticauda, mâle et femelle. Observer le dimorphisme sexuel aux niveaux des peignes et du metasoma.

Tityus bastosi Lourenço, 1984 (Fig. 22)

Cette espèce décrite au départ de l'Amazonie équatorienne a pu être collectée par la suite dans des régions amazoniennes du Pérou et Brésil (Lourenço 1984a, 1992). Comme pour *Tityus silvestris*, une définition «d'ochlospecies» a pu être attribuée également à *Tityus bastosi*. Actuellement trois exemplaires appartenant à cette espèce sont signalés pour la première fois pour la Colombie. Les nouvelles stations élargissent considérablement la répartition de cette espèce vers le nord.



FIGS 11-15

Pinces, vue externe, d'*Opisthacanthus elatus*, mâle, *Rhopalurus laticauda*, mâle et de *Centruroides gracilis*, mâle. 14. Tranchant du doigt mobile de *R. laticauda*. 15. Metasoma, vue ventrale, de *R. Laticauda*.

MATÉRIEL: Colombie, Dept. Boyaca, Otanche, VI/1986 (Indiens de Muzo), 1 femelle. Dept. Caqueta, Montanita (470 m), 11/IV/1990 (Eleves, La Salle), 1 mâle. Dept. Meta, S. Macarena, 20/VI/1990 (J.C. Benito), 1 femelle).

Tityus betschi Lourenço, 1992

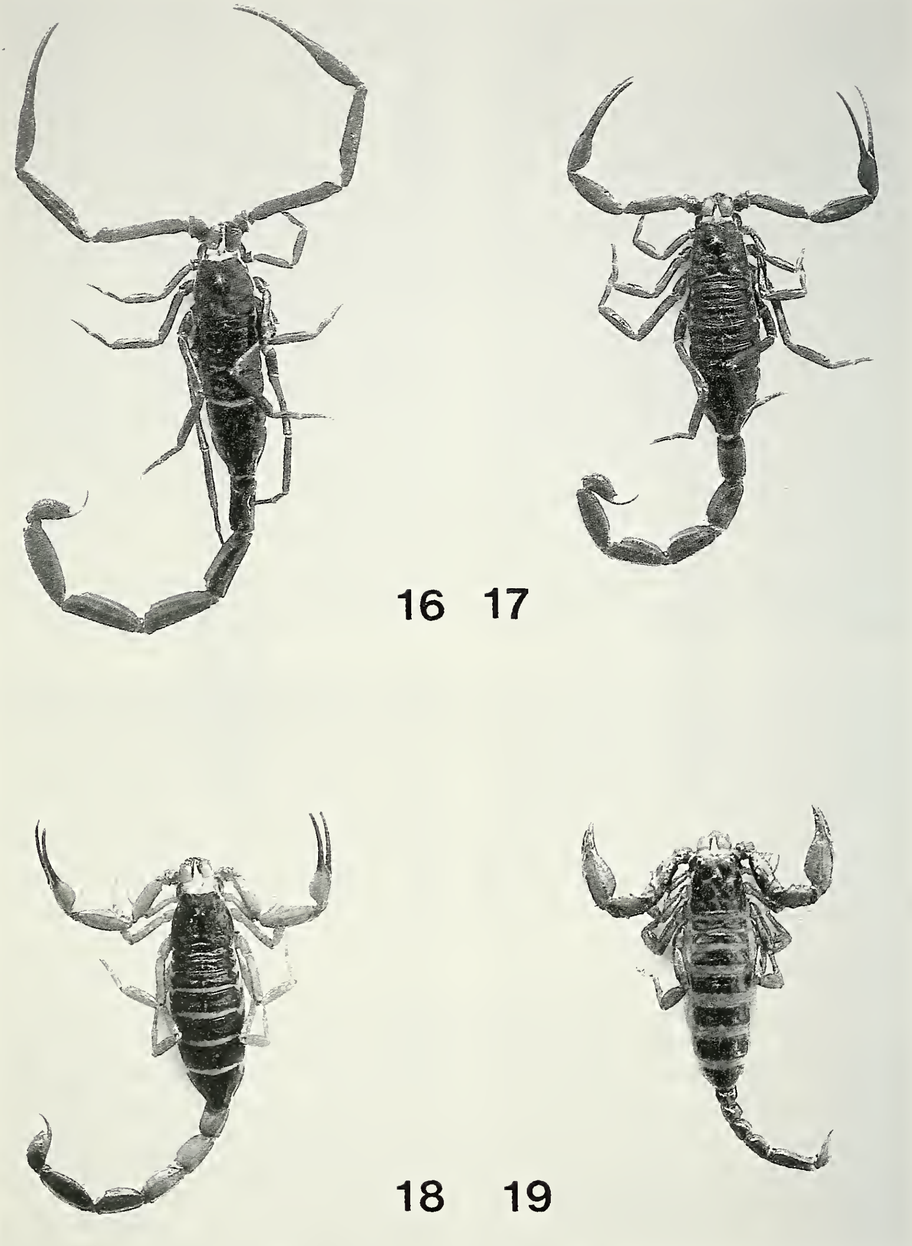
Cette espèce appartient au groupe naturel «*Tityus clathratus*». Elle est connue de la seule femelle holotype décrite du Dept. Valle del Cauca, Parque Nacional Farallones. Aucune autre donnée n'est disponible sur la répartition de cette espèce.

Tityus blanci Lourenço, 1994 (Figs 26, 28)

Cette espèce semble appartenir à un groupe voisin des grands *Tityus* sombres ou noirs tels *Tityus metuendus* et *Tityus tucurui*. Les définitions de ces groupes demeurent cependant encore insuffisament établies. *Tityus blanci* présente néanmoins une coloration générale bien plus claire que celles des espèces déjà citées. Seuls le mâle holotype et la femelle allotype sont connus pour deux localités en Colombie: Araracuara Dept. Amazonas et Restrepo Dept. Meta. Cette espèce semble appartenir à la faune de la région amazonienne.

Tityus charalaensis Mello-Leitão, 1940

MELLO-LEITÃO donne une description courte et non illustrée de cette espèce qui, selon lui, provenait de Charala en Colombie. La description a été basée sur un



FIGS 16 et 17. *Tityus asthenes*, mâle et femelle. 18. *Tityus sastrei*, femelle-holotype. 19. *Chactas mauriesi*, femelle-holotype.

seul exemplaire femelle. Le type a été par la suite déposé au Musée de l'Université de La Salle à Bogota et détruit lors des incendies de 1948. Cette espèce semble être voisine de *Tityus lourençoi* Florez, 1995, cependant en l'absence de tout autre matériel, une décision définitive reste en suspens.

Tityus columbianus (Thorell, 1876)

Cette espèce est certainement la plus commune et la plus abondante parmi les Scorpions de Colombie. Elle fait partie de petites espèces tachetées appartenant au groupe «*Tityus clathratus*» et sa position taxonomique a été confirmée par Lourenço (1984a, 1992). Plus récemment Lourenço (1991c) démontre l'existence de deux populations, une parthénogénétique et une sexuée respectivement dans les Départements de Cundinamarca et Boyaca. Une troisième population semble être présente dans la région d'Angelopolis, Dept. Antioquia, cependant peu de données sont disponibles sur cette dernière.

Matériel: Forme parthénogénétique: Colombie, Cundinamarca, Mosquera, 24/II/1988 (W.R. Lourenço), 11 juveniles. Idem, 26/II/1988, 1 femelle, 7 juvéniles (1er stade). Idem, 20/II/1993, 19 femelles. Idem, 27/II/1993, 133 femelles, 1 juvénile. Forme sexuée: Boyaca, Iza, 22–25/II/1993 (W.R. Lourenço), 15 mâles, 87 femelles. Villa de Leiva, IX/1984 (Werding), 1 mâle, 2 femelles.

Tityus cuellari Lourenço, 1994 (Fig. 30)

Cette espèce décrite de La Planada, Dept. Nariño est très étroitement liée à *Tityus forcipula* (Gervais). Sa description a été basée sur les deux seuls exemplaires (femelles) connus. Une analyse de la position de ces deux espèces, ainsi que celle de l'ancienne espèce *Tityus spinatus* Pocock, pourra s'avérer utile dès que du nouveau matériel viendra à être disponible. La répartition de cette espèce semble se limiter à la région sud-occidentale de Colombie.

Tityus engelkei Pocock, 1902

Espèce appartenant au groupe «*Tityus melanostictus*», pour laquelle le statut taxonomique a été redéfini par Lourenço & Eickstedt (1987) lors d'une révision des espèces du groupe. *Tityus engelkei* est de toute évidence une espèce endémique pour la région de Santa Marta au nord de la Colombie d'où elle a été décrite.

Au cours de la présente étude aucun matériel supplémentaire n'a été examiné.

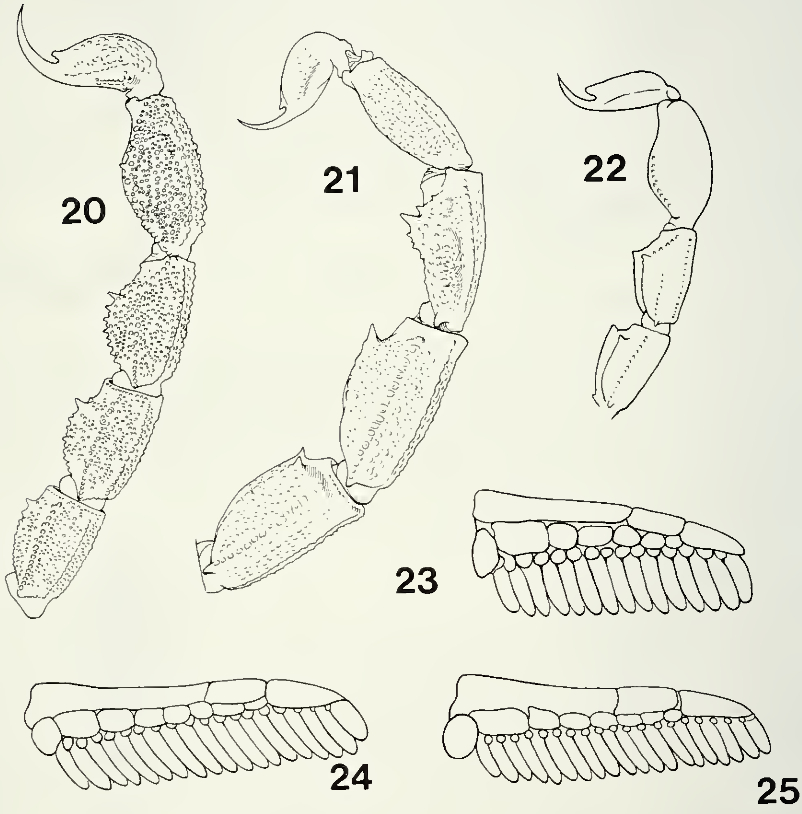
Tityus festae Borelli, 1899

Cette espèce décrite de Tintin, Darién au Panama, est voisine des grands *Tityus* de couleur sombre noire, tels *Tityus pachyurus* aussi distribué en Panama et Colombie. *Tityus festae* demeure cependant une espèce peu caractérisée taxonomiquement (Lourenço 1984b), car elle n'est connue que du mâle holotype de Panama et d'une femelle de Santa Marta en Colombie.

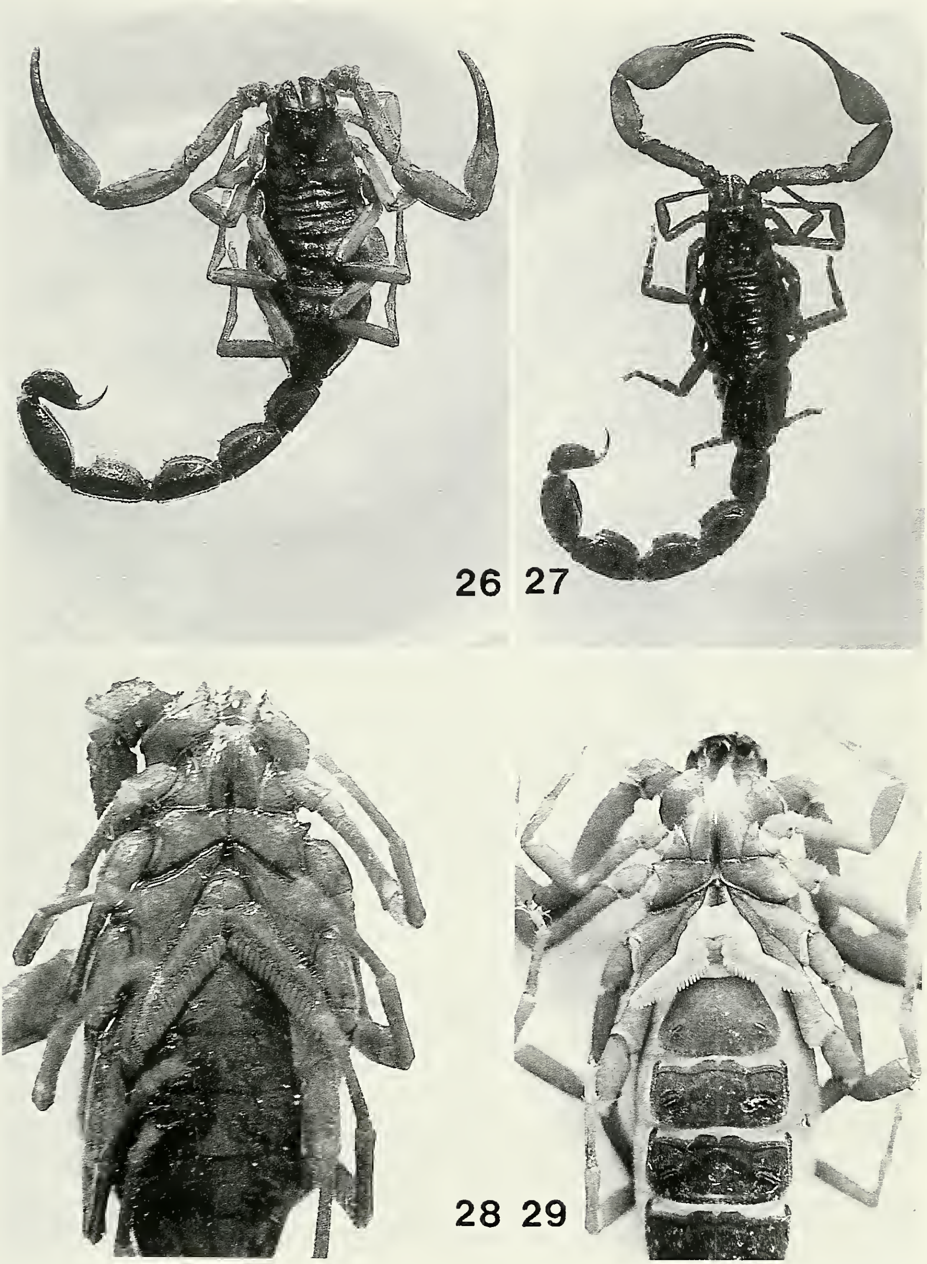
Tityus forcipula (Gervais, 1844) (Fig. 20)

Cette ancienne espèce de Gervais définit son propre groupe naturel. Elle a été décrite sans aucune précision de localité typique, cependant des collectes récentes dans la région sud occidentale de Colombie ont bien attesté de sa présence, confortant ainsi son origine colombienne. La position taxonomique de l'espèce a déjà été bien établie par Lourenço (1984b), et la récente description de *Tityus cuellari* démontre une grande affinité entre ces deux espèces.

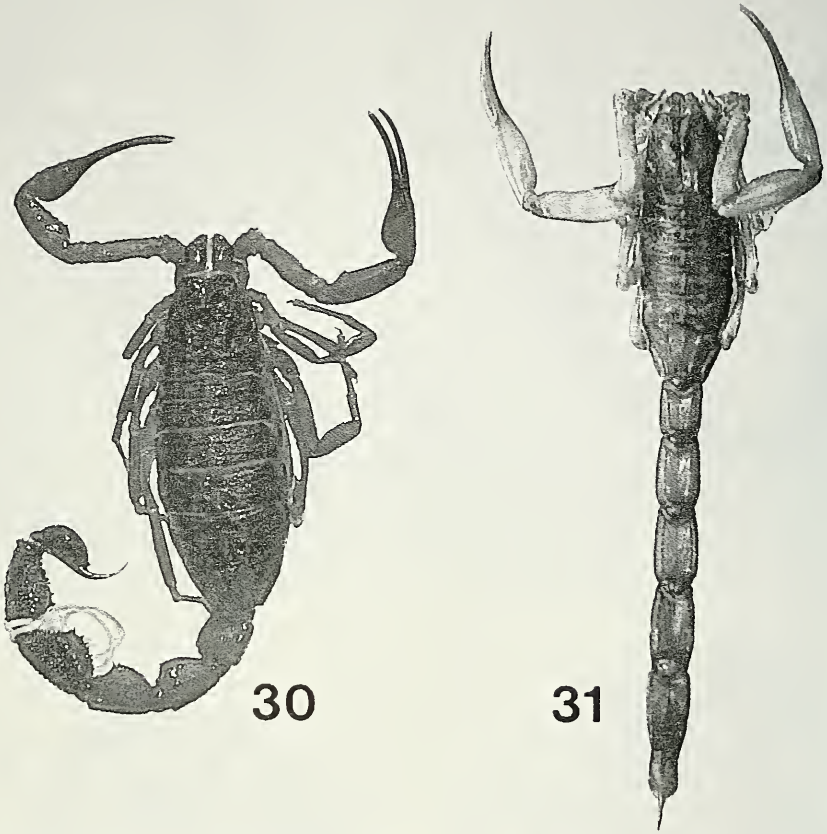
Matériel: Colombie, Dept. Valle, Peñas Blancas (2100 m), 15/II/1988 (W.R. Lourenço), 5 femelles, 23 immatures).



Figs 20 à 22. Metasoma, vue latérale, de *Tityus forcipula*, *Tityus fuhrmanni* et *Tityus bastosi*, mâles. Figs 23 à 25. Peignes de *Tityus fuhrmanni*, mâle et de *Tityus pachyurus* mâle et femelle.



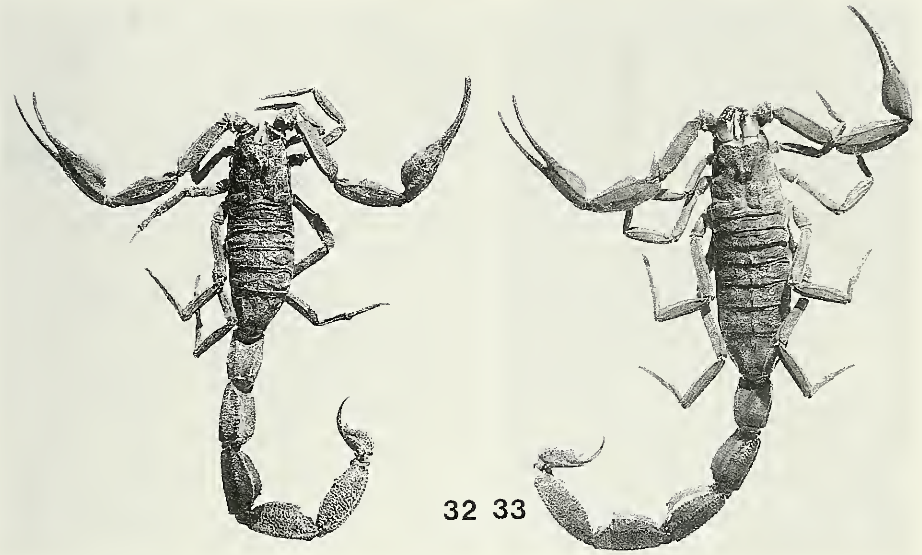
FIGS 26. *Tityus blanci*, mâle-holotype. 27. *Tityus sabineae*, mâle-holotype. 28 et 29. Régions ventrales de *Tityus blanci*, mâle-holotype et de *Tityus sastrei*, femelle-holotype.



Figs 30. *Tityus cuellari*, femelle-holotype. 31. *Tityus lourençoi*, mâle-holotype.

Tityus fuhrmanni Kraepelin, 1914 (Figs 21, 23)

Cette espèce décrite d'Angelopolis, Dept. Antioquia, correspond à une des espèces les plus particulières du genre *Tityus*, par la morphologie assez extravagante de son metasoma avec présence d'épines très développées. Certains auteurs comme Mello-Leitão ont été tentés de créer un groupe isolé pour cette espèce, cependant il nous a paru préférable (Lourenço 1984b) de l'associer à celui de *T. forcipula* jusqu'à ce que nous ayons plus de données sur cette espèce. Le matériel type décrit par Kraepelin demeure le seul connu depuis la description de l'espèce.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FIGS 32 et 33. *Tityus pachyurus*, mâle et femelle.

Tityus lourençoi Florez, 1995 (Fig. 31)

Cette espèce récemment décrite de Fusagasuga, Dept. Cundinamarca, est selon l'auteur assez proche de *Tityus charalaensis*. Seul le matériel type est connu et la répartition de l'espèce est limitée à la station typique.

Tityus macrochirus Pocock, 1897

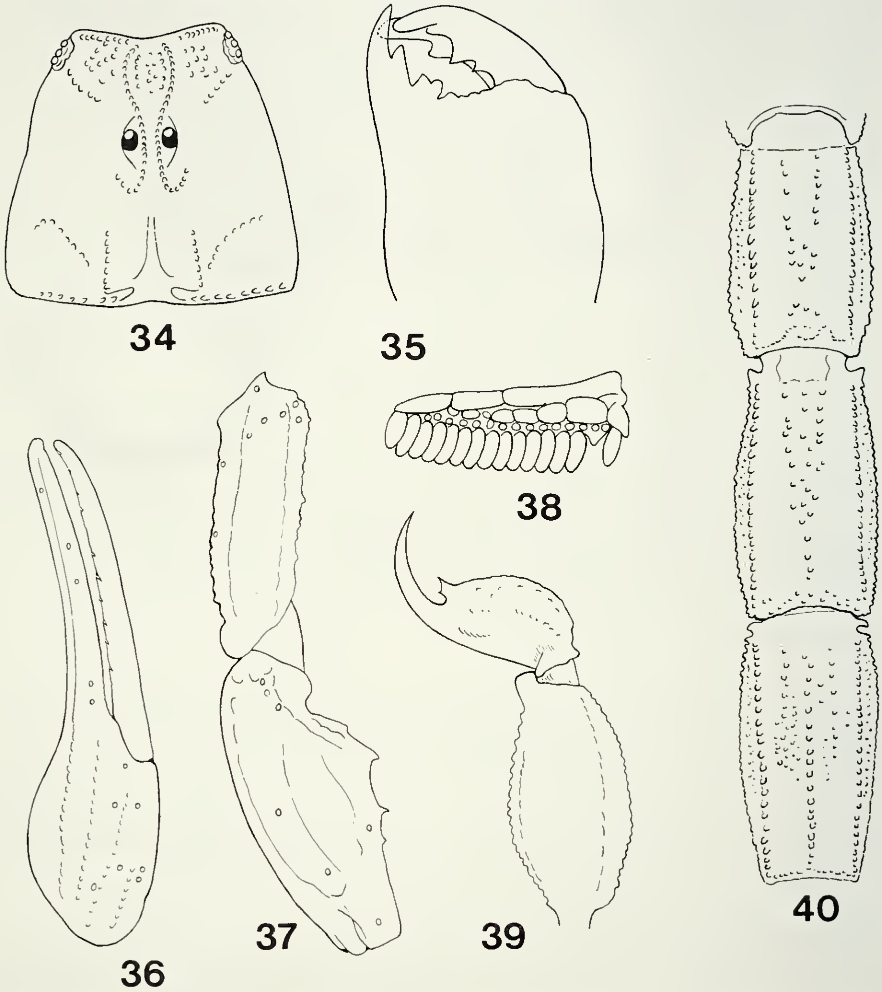
Cette espèce décrite, selon POCOCK, de Bogota, Dept. Cundinamarca, a été associée au groupe «*Tityus forcipula*» par LOURENÇO (1984b), qui a bien reconnu sa validité taxonomique. La station typique Bogota pourrait cependant être erronée car de nouvelles collectes dans cette région de Colombie n'ont rapporté aucun spécimen nouveau. Les erreurs de provenance des espèces colombiennes sont d'une manière générale assez nombreuses. Cette espèce demeure connue d'après un mâle et une femelle décrits par Pocock.

Tityus nematochirus Mello-Leitão, 1940

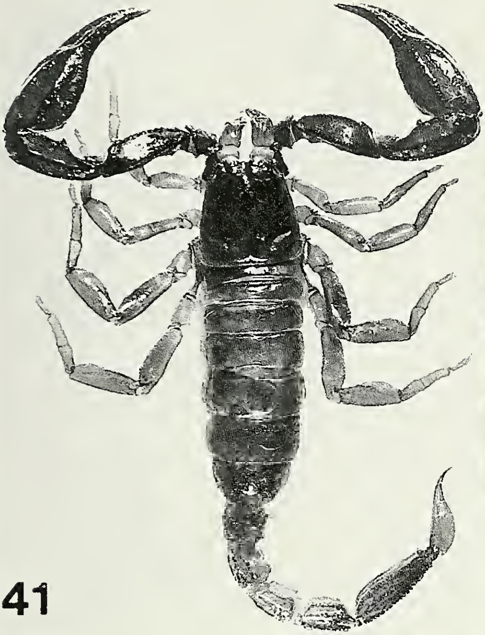
Cette espèce a été décrite de Villavicencio, Dept. Meta en même temps que *Tityus charalaensis*. Les types sont également perdus et de nouvelles prospections dans la localité typique n'ont pas permis la découverte de nouveaux exemplaires. Ceci pourrait être encore une fois la conséquence de l'imprécision des localités au départ.

Un série importante d'exemplaires appartenant à cette espèce a pu être collectée plus au nord, dans le Dept. de Boyaca, à Otanche, 100 Km à W. de Tunja. Ce matériel déjà cité par Lourenço (1991a), permet de confirmer la validité de cette espèce très particulière par l'extrême allongement des palpes des mâles. *Tityus nematochirus* peut être associé au groupe des espèces de *Tityus* de grande taille, sombres-noirâtres. La citation de cette espèce par Gonzalez-Sponga (1984) pour le Venezuela mérite à mon avis, une confirmation.

Matériel: Colombie, Dept. Boyaca, Otanche, 100 Km à W de Tunja, région de Muzo IV–VI/1986 (Indiens de la mine de Muzo), 9 mâles, 15 femelles.



Figs 34 à 40. *Tityus rebierei*, mâle-holotype. 34. Plaque prosomienne. 35. Chélicère. 36. Pince, vue externe. 37. Fémur et tibia, vue dorsale. 38. Peigne. 39. Vème anneau et telson. 40. Anneaux III à V du metasoma, vue ventrale.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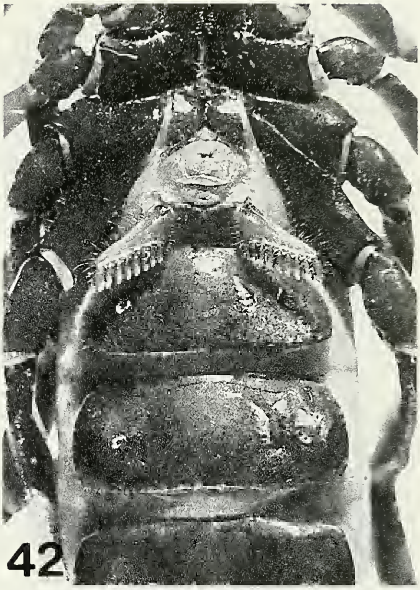
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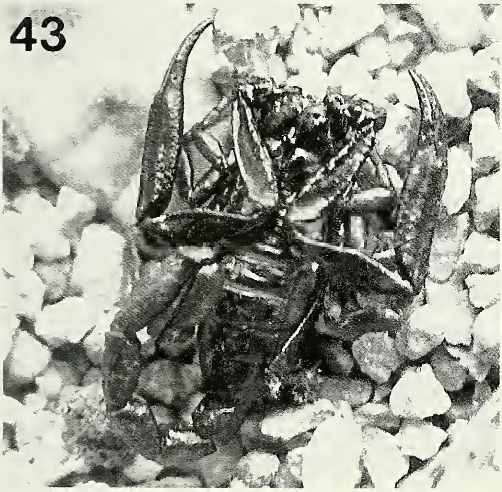
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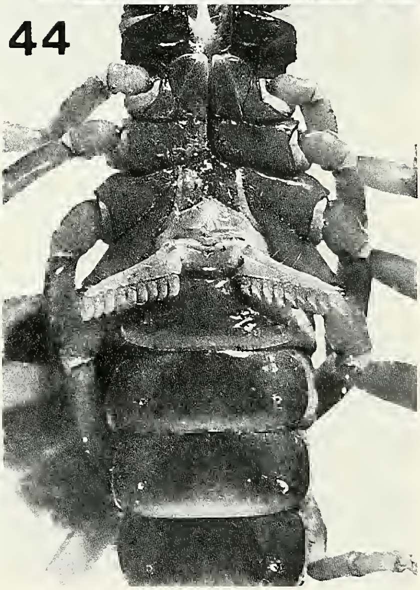
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FIGS 41. *Chactas aequinoctialis*, femelle. 42. Région ventrale de *C. aequinoctialis*, femelle. 43. *Chactas vanbenedeni*, mâle. 44. Région ventrale de *Chactas brevicaudatus*, mâle.

Figs 45 et 46. *Chactas hauseri*, femelle-holotype. 45. Vue dorsale. 46. Vue ventrale.

Tityus pachyurus Pocock, 1897 (Figs 24, 25, 32, 33)

Pocock décrit cette espèce de Colombie sans précision de station typique. Les types cependant ne sont plus dans la collection du Natural History Museum. Au cours d'une étude sur les Scorpions de Panama par Lourenço & Mendez (1984), de nombreux exemplaires de Panama ont été examinés confirmant la validité de cette espèce. Une femelle préalablement examinée par Pocock, ayant pour provenance la Cordillère orientale, Colombie entre Handa et Guadnas a pu également être étudiée. Deux nouveaux exemplaires provenant du nord du Choco en Colombie confirment ainsi la présence de cette espèce dans le pays.

Matériel: Colombie, Dept. Choco (près de la frontière avec Panama), 9–12/II/1964 (R. Rojas), 1 mâle, 1 femelle.

Tityus rebierei sp. n. (Figs 34 à 40)

Holotype (mâle): Colombie, Dept. Norte de Santander, Chinacota-Teneria (Via Pte. Vargas; 1420 m), 3/X/1992 (C. Velez)

Allotype (femelle): Mêmes données que pour l'holotype.

Etymologie: Le nom spécifique est attribué en hommage à M. Jacques Rebière du Lab. Zoologie Arthropodes, M.N.H.N., pour sa collaboration à la recherche sur les Arachnides.

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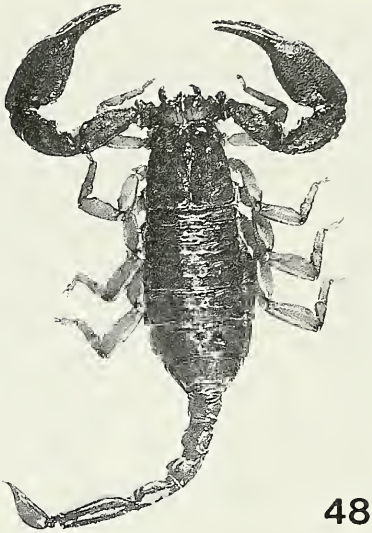

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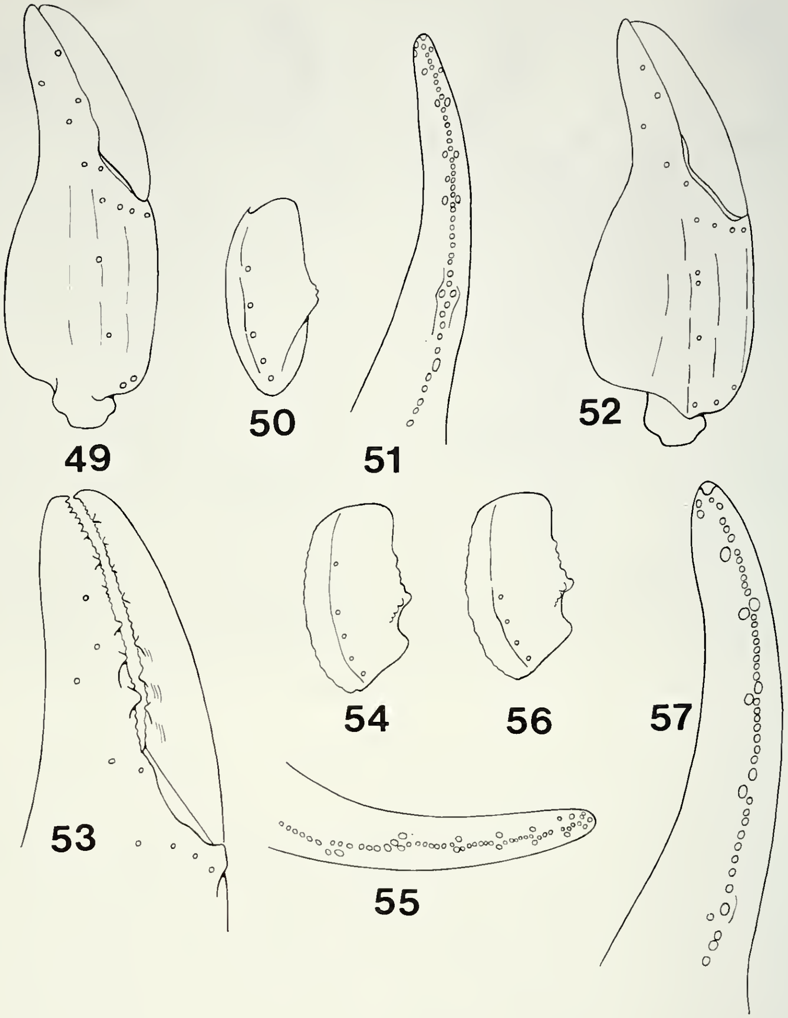
FIG. 47. *Chactas brownelli*, mâle-holotype. FIG. 48. *Chactas barravierai*, femelle-holotype.

DIAGNOSE: Espèce proche de *Tityus lancinii* Gonzalez-Sponga, 1972 décrite du «Pico Naiguara» région cotière, Etat Miranda, Venezuela. Les deux espèces peuvent néanmoins être distinguées par la disposition des carènes ventrales des anneaux III et IV du metasoma. Parallèles chez *T. lancinii* et fusionnées distalement, en forme de Y chez la nouvelle espèce.

DESCRIPTION FONDÉE SUR L'HOLOTYPE MALE.

Coloration générale jaunâtre avec des taches châtain brunâtre-clair. Prosoma: Plaque prosomienne avec cette même coloration; tubercule oculaire et yeux médians noirâtres. Mesosoma: tergites I à VII avec des taches plus intenses que celles de la plaque prosomienne. Sternites jaune brunâtre avec des taches quelque peu diffuses. Metasoma: anneaux caudaux I à III jaunâtres; IV et V rouge noirâtre. Telson rougeâtre; aiguillon jaune rougeâtre. Peignes jaunâtre clair; opercule génital, sternum, hanches et processus maxillaires ocre-jaune. Pattes jaunâtres, avec des esquisses de taches brunâtres très diffuses. Pédipalpes rougeâtre clair; doigts des pinces rouge noirâtre avec les extrémités jaunâtres. Chélicères jaunâtres avec une trame de taches noires très dense dans la partie antérieure; les doigts sont noirâtres.

Morphologie. Prosoma: front de la plaque prosomienne avec une échancrure frontale moyennement marquée. Tubercule oculaire antérieur par rapport au centre de la plaque prosomienne; yeux médians séparés par plus d'un diamètre oculaire; trois paires d'yeux latéraux. Plaque prosomienne moyennement granulée; carènes médianes oculaires allant du bord antérieur jusqu'en arrière du tubercule oculaire; carènes médianes postérieures moyennement marquées, délimitant approximativement un carré dans la région postéro-médiane de la plaque prosomienne; sillon interoculaire moyennement marqué. Mesosoma: tergites peu granulés; carène axiale présente sur



FIGS 49 à 51. *Chactas hauseri*, femelle-holotype. 49. Pince, vue externe. 50. Tibia, vue ventrale. 51. Tranchant du doigt mobile. 52 à 55. *Chactas brownelli*, femelle-holotype. 52. Pince, vue externe. 53. Pince, en détail la région des doigts. 54. Tibia, vue ventrale. 55. Tranchant du doigt mobile. 56 et 57. *Chactas barravierai*. 56. Tibia, vue ventrale. 57. Tranchant du doigt mobile.

tous les tergites; tergite VII avec cinq carènes, l'axiale limitée au tiers antérieur; les médianes et latérales fusionnées dans la région proximale. Sternites très peu granulés; stigmates linéaires; peignes avec 15–15 dents; lame basilaire intermédiaire non dilatée. Metasoma: anneau I à 10 carènes; anneaux II à IV à 8 carènes; les ventrales fusionnées distalement sur les anneaux III et IV formant un Y; anneau V avec 5 carènes; espaces intercarénaux moyennement granulés; vésicule moyennement granulée; épine sous-aiguillonaire aiguë et importante, avec deux granules ventraux; Pédipalpes: fémur avec 5 carènes, tibia à 7 carènes, la carène interne-dorsale à granules spiniformes. Pince avec 8 carènes. Tranchant des doigts mobiles avec 15–15 séries de granules. Chélicères avec la dentition caractéristique des Buthidae; doigt fixe avec une dent interne; doigt mobile avec deux dents basales (VACHON 1963). Trichobothriotaxie: A–Alpha, orthobothriotaxique (VACHON 1973, 1975).

Allotype femelle: Différences avec l'holotype. Coloration plus foncée, allant vers le rougeâtre. Valeurs morphométriques plus importantes (cf. Tableau I). Peignes plus petits avec 15–14 dents; lame basilaire intermédiaire dilatée. Tranchant des doigts mobiles avec 14–14 séries de granules.

Pas de paratypes.

Tityus sabineae Lourenço, 1994 (Fig. 27)

Cette espèce décrite de Fusagasuga, Dept. Cundinamarca, peut être associée au groupe des *Tityus* de grande taille, de couleur sombre-noirâtre. L'étude de deux nou-

TABLEAU I

Mensurations (en mm) des espèces décrites

	T. rebierei		*C. hauseri*	*C. brownelli*		*C. barravierai*
	M	F	F	M	F	F
Prosoma						
– Longueur	4,4	5,3	5,6	6,7	7,8	7,5
– Largeur antérieure	3,5	3,2	3,8	4,4	4,4	4,7
– Largeur postérieure	5,8	6,5	6,1	6,6	7,8	8,2
Anneau caudal I						
– Longueur	2,8	3,2	2,2	2,8	2,7	2,2
– Largeur	2,8	3,2	2,7	3,1	3,0	3,2
Anneau caudal V						
– Longueur	5,1	6,3	4,8	6,4	5,7	6,2
– Largeur	2,8	3,1	2,0	2,4	2,3	2,4
– Hauteur	2,4	2,9	2,0	2,6	2,4	2,2
Vésicule						
– Largeur	1,8	2,1	2,2	2,8	2,0	2,4
– Hauteur	1,8	2,2	1,4	2,4	2,2	1,9
Pédipalpe						
– Fémur longueur	4,1	5,2	4,9	7,6	5,6	6,0
– Fémur largeur	1,5	1,8	1,9	2,0	2,2	2,4
– Tibia longueur	5,1	5,8	5,2	8,4	6,4	6,7
– Tibia largeur	2,2	2,7	2,2	2,4	2,6	3,4
– Pince longueur	8,7	10,4	9,4	13,2	12,5	12,3
– Pince largeur	1,9	2,3	2,9	2,8	3,4	4,7
– Pince hauteur	1,7	2,2	2,6	2,9	4,1	4,2
Doigt mobile						
– Longueur	6,2	7,6	4,4	5,4	5,8	6,7

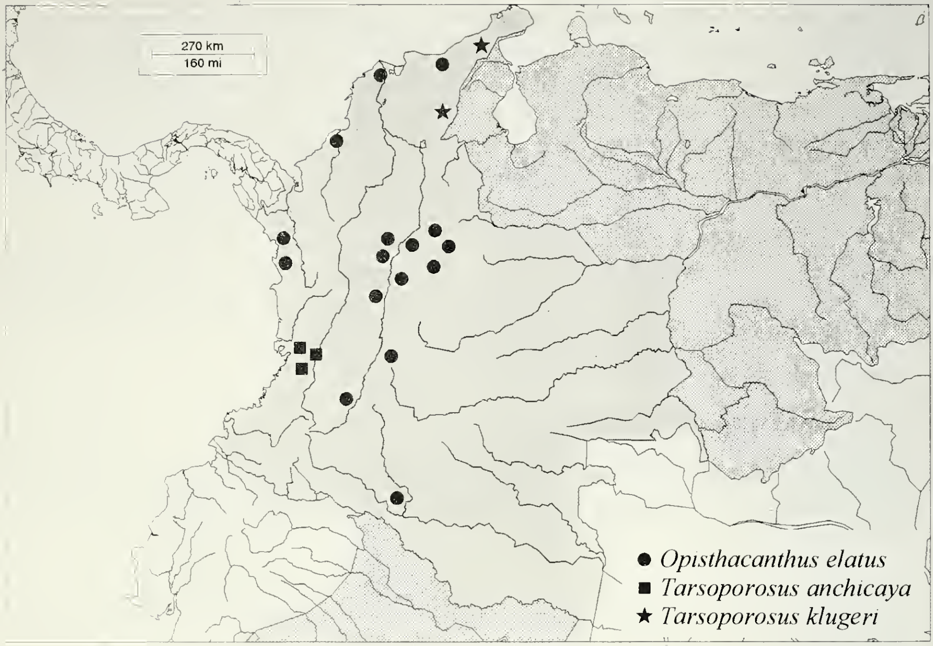


FIG. 58

Répartition connue des espèces des familles Ischnuridae et Diplocentridae, en Colombie.

veaux exemplaires élargit l'aire de répartition de cette espèce qui semble néanmoins restreinte à la Cordillère orientale.

MATÉRIEL: Colombie, Dept. Cundinamarca, Silvania (35 Km S–W de Bogota), 2/XI/1985 (F. le Crom), 1 femelle. Dept. Huila, Gigante, II/1985 (J.P. Thelot), 1 mâle.

Tityus sastrei Lourenço & Florez, 1990 (Figs 18, 29)

Espèce décrite de Bajo Calima-Buenaventura sur la côte pacifique, Dept. Valle del Cauca. Cette espèce devra probablement être incluse dans le groupe «*Tityus melanostictus*», cependant elle demeure peu caractérisée n'étant connue que d'après les deux exemplaires types (femelles). Cette espèce est de toute évidence endémique de la région côtière pacifique.

Tityus tayrona Lourenço, 1991 (Figs 7, 8)

Cette espèce appartient sans aucune hésitation au groupe «*Tityus clathratus*» (LOURENÇO 1992). Elle est de toute évidence endémique de la région de Santa Marta.

MATÉRIEL: Colombie, Dept. Magdalena, Bahia de Neguangue, P.N. Tayrona, 30/IX/1985 (H.G. Müller), 2 mâles paratypes.

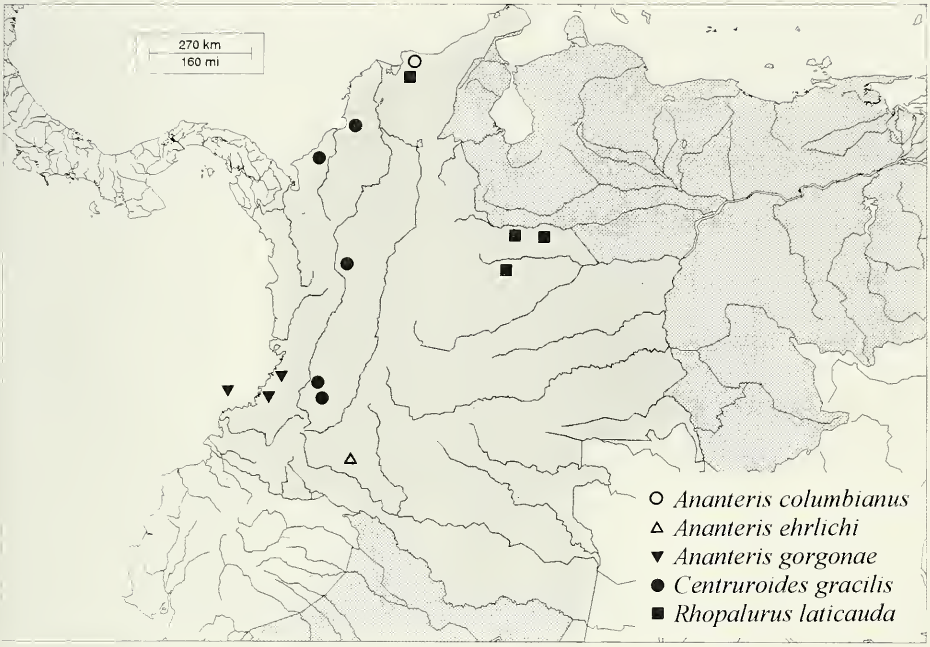


FIG. 59

Répartition connue des espèces des genres *Ananteris*, *Centruroides* et *Rhopalurus*, famille des Buthidae, en Colombie.

FAMILLE DES CHACTIDAE Laurie, 1896

GENRE *Brotheas* Koch, 1843

Brotheas camposi Gonzalez-Sponga, 1972

Seule espèce du genre connue pour la Colombie, *B. camposi* a été décrite de Castillo de san Felipe dept. Guainia en Amazonie colombienne. La région amazonienne de Colombie étant encore peu prospectée, d'autres espèces appartenant à ce genre pourront être découvertes dans des études à venir.

Seuls les exemplaires types sont connus.

GENRE *Chactas* Gervais, 1844

Le genre Chactas possède, de toute évidence, un centre de dispersion colombien de même que le genre *Teuthraustes* possède un centre de distribution équatorien (LOURENÇO 1995b). Le problème d'une définition précise du statut de chacune des espèces décrites se pose de la même manière qu'il a été posé pour les espèces du genre *Teuthraustes* (LOURENÇO 1995b), cependant dans le cas du genre *Chactas*, les difficultés sont bien plus grandes pour les raisons suivantes:

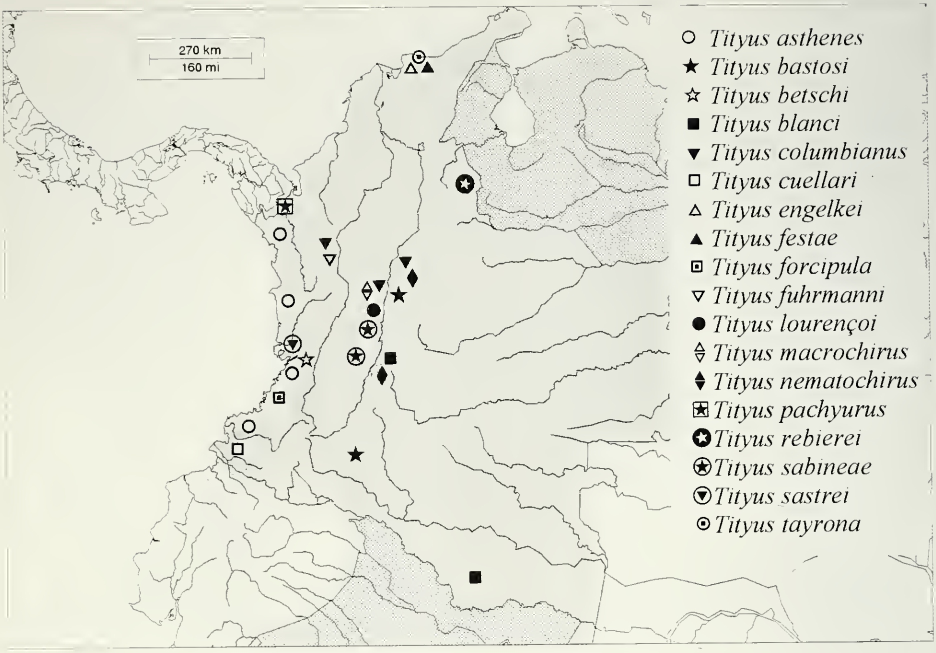


Fig. 60

Répartition connue des espèces du genre *Tityus*, famille des Buthidae, en Colombie.

– Le genre *Chactas* a été créé par Gervais, fondé sur l'espèce *Chactas vanbenedeni* avec pour seule indication comme station typique, Colombie. La caractérisation morphologique des espèces du genre *Chactas* est globalement très difficile, ainsi, plusieurs autres espèces de *Chactas* de Colombie (voire du Venezuela) possèdent des caractéristiques voisines de celles de *C. vanbenedeni*; cette situation ayant amené plusieurs auteurs (Mello-Leitão 1945; Gonzalez-Sponga 1984) à indiquer la présence de cette espèce dans de nombreuses localités imprécises.

– Les espèces décrites après *C. vanbenedeni* l'ont été également dans une grande partie des cas sans aucune précision de station typique, et parfois sans même une précision de pays (cf. *Chactas crysopus* Pocock, 1893).

– Le matériel type encore existant est en général dans un état de conservation, pas toujours très bon, situation qui rend difficile une bonne diagnose des espèces décrites.

– Une confusion nomenclaturale insolite et particulière au seul genre *Chactas* a été établie à partir du travail de révision réalisé par Kraepelin (1912) et amplifiée par les travaux de Mello-Leitão (1945) et Gonzalez-Sponga (1978). Kraepelin dans sa révision, suggère l'existence de trois groupes «naturels» dans lesquels il répartit les espèces de *Chactas*, et pour l'espèce *Chactas lepturus* Thorell, il propose l'existence

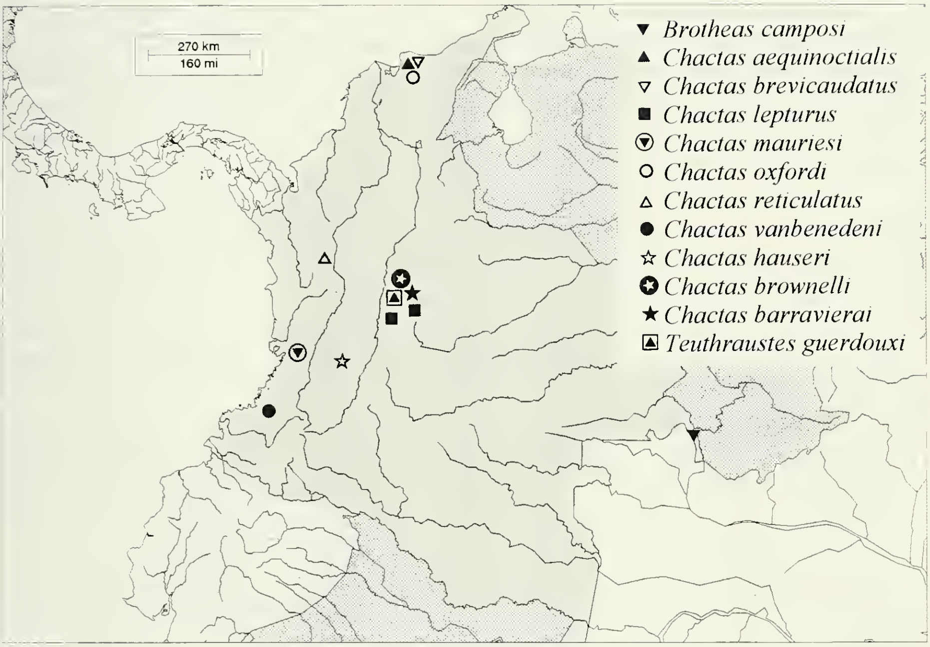


FIG. 61

Répartition connue des espèces de la famille des Chactidae, en Colombie.

de quatre «variétés»: *typicus*, *keyserlingi* (espèce décrite par POCOCK) et deux variétés nouvelles, *intermedius* et *major*. Dans sa monographie, MELLO-LEITÃO (1945) élève les «groupes d'espèces» au rang de sous-genres et les variétés au rang de sous-espèces. GONZALEZ-SPONGA (1984) ajoute deux nouveaux sous-genres: *Caribeochactas* et *Andinochactas*. Ces décisions de découpage sous-générique étant pour la plupart fondées sur la présence ou absence d'une ou deux trichobothries.

A présent il me semble que de tels découpages peu fondés sont une grande source de confusion, d'autant que sur la seule base du nombre de trichobothries, bien d'autres genres pourraient être divisés tels *Microtityus* ou *Liocheles* (LOURENÇO & EICKSTEDT 1983; FRANCKE & LOURENÇO 1991). Aussi je pense que le genre *Chactas* doit rester indivis et que les différents sous-genres doivent à présent être supprimés. En ce qui concerne les «variétés» devenues des sous-espèces, l'étude d'un certain nombre d'exemplaires types, conduit à estimer *Chactas lepturus* comme une espèce complexe, probablement polymorphe. L'imprécision de l'origine des stations typiques, ainsi que l'insuffisance de matériel collecté empêchent pour l'instant une définition précise du modèle de polymorphisme observé tel que cela a été possible chez des espèces du genre *Tityus* (LOURENÇO 1986, 1988; LOURENÇO & EICKSTEDT 1988).

D'après l'étude des types et du matériel disponibles, sont retenues comme valables (pour la Colombie) les espèces suivantes de *Chactas*:

Chactas aequinoctialis (Karsch, 1879) et *Chactas brevicaudatus* (Karsch, 1879), (Figs 41, 42, 44) décrites toutes les deux de Colombie sans stations précises, elles sont par la suite définies comme endémiques de Santa Marta (LOURENÇO 1991a) Les deux espèces sont cependant en «allopatrie», car séparées par un gradient altitudinal. *C. brevicaudatus* se trouve pratiquement au niveau de la mer tandis que *C. aequinoctialis* est retrouvée à partir de 1000 m.

Chactas chrysopus Pocock, 1893. Malgré que la localité typique soit inconnue, l'étude du type de cette espèce autorise à la considérer comme valable.

Chactas karschi Pocock, 1893. nec *Chactas lepturus* (Karsch, 1879). Seul l'étude du type a été possible.

Chactas lepturus Thorell, 1878. L'étude de l'holotype a été possible ainsi que celui de deux femelles et 17 immatures, maintenant déposés au M.H.N.G.: Colombie, Dept. Cundinamarca, Mosquera, 22/II/1988 (W.R. Lourenço).

Chactas mauriesi Lourenço & Florez, 1990. Espèce décrite de la côte pacifique de Colombie (Dept. Valle del Cauca) où elle est de toute évidence endémique. Cette espèce, la plus petite du genre, est connue uniquement de deux exemplaires types.

Chactas oxfordi Gonzalez-Sponga, 1978. Cette espèce décrite de la Sierra Nevada de Santa Marta, Dept. Magdalena semble très voisine de *Chactas aequinoctialis* et de *C. brevicaudatus*, ainsi que le remarque l'auteur même de l'espèce. GONZALEZ-SPONGA dresse cependant un tableau des différences morphologiques. L'analyse de la description de *C. oxfordi*, laisse supposer que cette espèce pourrait être valable, et que sa station de collecte (entre 1900 et 2300 m) correspondrait à un troisième étage dans le gradient altitudinal. L'examen des types n'a pas été possible.

Chactas reticulatus Kraepelin, 1914. Espèce décrite de Angelopolis dans la cordillère centrale. La station typique de cette espèce est située très au nord-ouest de la Colombie et cette région semble correspondre à un centre d'endémisme. Les caractéristiques morphologiques définies par KRAEPELIN (1914) sont suffisament claires pour confirmer la validité de cette espèce. Le type n'a pas pu être étudié.

Chactas vanbenedeni Gervais, 1844 (Fig. 43). L'espèce type du genre a été décrite au départ sans précision de localité typique. LOURENÇO (1995c), associe définitivement cette espèce à la population trouvée sur la côte sud pacifique, dans les Départements del Valle del Cauca et Valle. Le type n'a probablement jamais été indiqué par GERVAIS; en tout cas il n'est pas présent dans les collections du Muséum à Paris.

MATÉRIEL: Colombie, Dept. Valle del Cauca, Tulua (Forêt, 973 m), 4–6/II/ 1988 (W.R. Lourenço), 1 mâle, 1 femelle et 2 juvéniles (1 mâle et une femelle).

TROIS ESPECES NOUVELLES POUR LE GENRE *Chactas*

Chactas hauseri sp. n. (Figs 45, 46, 49, 50, 51)

Holotype (femelle): Colombie. Dept. Tolima, St. Antonio (1800 m), 6/I/1991 (O. Villalobos).

Etymologie: Le nom spécifique est attribué en hommage au Dr B. Hauser du Muséum d'histoire naturelle de Genève.

DIAGNOSE: La nouvelle espèce est de taille moyenne (cf. Tableau I) et peut être distinguée des autres espèces du genre, et en particulier de *Chactas chrysopus* Pocock (l'espèce la plus voisine), par un nombre de peignes plus élevé – 9 versus 6 – et par un tégument globalement plus lisse.

DESCRIPTION FONDÉE SUR L'HOLOTYPE FEMELLE

Coloration générale châtain jaunâtre. Prosoma: plaque prosomienne châtain jaunâtre foncé, avec des zones plus claires en avant et en arrière. Tubercule oculaire moitié foncé, moitié clair. Mesosoma: tergites d'une coloration semblable à celle de la plaque prosomienne, avec une bande jaunâtre longitudinale. Metasoma: tous les anneaux de coloration semblable à celle des tergites, avec les deux derniers plus clairs, jaunâtres. Vésicule jaunâtre foncé, nuancée de deux bandes plus claires latérales et longitudinales. Aiguillon à base rouge jaunâtre et à extrémité rougeâtre foncé. Sternites jaunâtres avec des taches foncées latérales, bien marquées sur l'ensemble du VII^{ème}. Peignes, opercule génital, sternum, hanches et processus maxillaires ocre jaune avec des zones plus foncées sur le processus maxillaire. Pattes jaunâtres avec quelques taches brunâtres. Pédipalpes châtain rougeâtre; doigts des pinces avec des tons rouge noirâtre. Chélicères jaunâtres avec une trame noirâtre.

Morphologie. Prosoma: plaque prosomienne avec le front très peu concave, presque droit. Tubercule oculaire antérieur par rapport au centre de la plaque prosomienne. Yeux médians séparés par presque 1,0 diamètre oculaire. Deux yeux latéraux, l'œil antérieur dirigé en partie vers l'avant. Pas de granulations sur la surface de la plaque prosomienne, plutôt chagrinée. Mesosoma: tergites sans carènes, chagrinés également. Metasoma: anneaux I à V avec quelques esquisses de carènes incomplètes; carènes dorsales plus marquées; carènes ventrales du cinquième anneau avec quelques granules spiniformes; espaces intercarénaux pratiquement lisses sur les anneaux I à IV. Vésicule faiblement granulée. Sternites à stigmate ovales, presque arrondis. Peignes avec 9–9 dents. Pédipalpes: fémur avec 5 carènes presque toutes complètes; tibia et pince avec 5 et 7 carènes incomplètes, marquées plutôt par des granules épars; tous les segments peu granulés. Doigt mobile avec 7 séries de granules; granules accessoires discrets. Pattes avec la présence d'une rangée de 9–10 très fines spicules axiaux sur la face ventrale des telotarses. Chélicères avec la dentition caractéristique des Chactidae (VACHON 1963). Trichobothriotaxie du type C, néobothriotaxie majorante (VACHON 1973).

Pas d'allotype ni de paratypes.

Chactas brownelli sp. n. (Figs 47, 52 à 55)

1991 *Chactas keyserlingi*: Lourenço-Senckenbergiana, 71(4–6): 286.

HOLOTYPE (mâle): Colombie, Dept. Boyaca, Otanche-Muzo, IV/1986 (coll. Indien de la mine de Muzo).

Allotype (femelle) et Paratypes (2 mâles et 20 femelles). Mêmes données que pour l'holotype.

Etymologie: Le nom spécifique est attribué en hommage au Dr Ph. Brownell de la «Oregon State University», Corvallis, U.S.A.

Diagnose: Espèce de taille moyenne (cf. Tableau I) qui peut être distinguée des autres espèces du genre, et en particulier de Chactas brevicaudatus (Karsch), espèce la plus voisine, par la présence de 8–9 épines courtes aux tarses des pattes, alors que chez C. brevicaudatus les tarses sont munis de longues soies. En outre, cette dernière espèce est de toute évidence endémique de Santa Marta.

TABLEAU II

VARIABILITÉ DU NOMBRE DES DENTS DES PEIGNES CHEZ *Chactas brownelli.*

Nb. dents	Mâles	Femelles
9	7	37
10	1	3

DESCRIPTION FONDÉE SUR L'HOLOTYPE MALE

Coloration générale châtain rougeâtre. Prosoma: plaque prosomienne châtain rougeâtre foncé, avec des zones un peu plus claires derrière les yeux médians et sur les sillons latéraux. Tubercule oculaire foncé, presque noir. Mesosoma: tergites d'une coloration semblable à celle de la plaque prosomienne, avec une bande centrale longitudinale jaunâtre. Metasoma: tous les anneaux de coloration semblable à celle des tergites, avec des zones plus claires, jaunâtres. Vésicule rouge jaunâtre, nuancée de deux bandes rougeâtres latérales et longitudinales. Aiguillon à base jaunâtre et à extrémité rouge noirâtre. Sternites jaune rougeâtre; le septième est plus foncé. Peignes, opercule génital, sternum ocre-jaune; hanches et processus maxillaires rougeâtres. Pattes jaune rougeâtre avec quelques nuances des taches brunâtres. Pédipalpes châtain rougeâtre; doigts des pinces avec des tons rouge noirâtre. Chélicères rougeâtres avec une trame noirâtre.

Morphologie. Prosoma: plaque prosomienne avec le front très peu concave, presque droit. Tubercule oculaire antérieur par rapport au centre de la plaque prosomienne. Yeux médians séparés par 1,0 diamètre oculaire. Deux yeux latéraux, l'œil antérieur dirigé vers l'avant. Pas de granulations sur la surface de la plaque prosomienne, plutôt chagrinée. Mesosoma: tergites sans carènes, chagrinés également. Metasoma: anneaux I à IV avec quelques esquisses de carènes incomplètes; carènes dorsales plus marquées; carènes ventrales du cinquième anneau avec des granulations spiniformes; espaces intercarénaux très peu granulés; faces dorsales des anneaux IV et V légèrement granulées. Vésicule légèrement granulée. Sternites à stigmates ovales, presque arrondis. Peignes avec 10–9 dents (cf. Tableau II). Pédipalpes: fémur avec 4 carènes presque toutes complètes; tibia et pince avec quelques carènes esquissées, pince pratiquement lisse; présence de quelques granules épars. Doigt mobile avec 7–7 séries de granules, les accessoires très discrètes. Pattes avec la présence d'une rangée d'épines courtes sur la face ventrale des telotarses. Chélicères avec la dentition caractéristique des Chactidae (VACHON 1973). Trichobothriotaxie du type C, néobothriotaxie majorante (Vachon 1973).

Allotype femelle: Différences avec l'holotype: Coloration plus sombre en particulier les pattes; pinces plus trapues, avec des valeurs morphométriques bien distinctes (cf. Tableau I).

Chactas barravierai sp. n. (Figs 48, 56, 57)

1991 *Chactas keyserlingi:* Lourenço-Senckenbergiana 71(4–6): 286.

HOLOTYPE (femelle): Colombie, Dept. Boyaca, Otanche-Muzo, IV/1986 (coll. Indien de la mine de Muzo).

Etymologie: Le nom spécifique est attribué en hommage au Dr Benedito Barraviera du CEVAP-UNESP, Botucatu, Brésil.

DIAGNOSE: Espèce de taille moyenne (cf. Tableau I) qui peut être distinguée des autres espèces du genre, et en particulier de *Chactas hauseri*, l'espèce la plus voisine, par la présence de 4 trichobothries sur la face ventrale du tibia, alors que chez les autres espèces du genre ce nombre est de 5 ou 6.

DESCRIPTION FONDÉE SUR L'HOLOTYPE FEMELLE

Coloration générale châtain rougeâtre. Prosoma: plaque prosomienne châtain rougeâtre foncé, avec des zones un peu plus claires derrière les yeux médians et sur les sillons latéraux. Tubercule oculaire foncé, presque noir. Mesosoma: tergites d'une coloration semblable à celle de la plaque prosomienne, avec une bande centrale longitudinale jaunâtre. Metasoma: tous les anneaux de coloration semblable à celle des tergites, avec des zones plus claires, jaunâtres. Vésicule rouge jaunâtre, nuancée de deux bandes rougeâtres latérales et longitudinales. Aiguillon à base jaunâtre et à extrémité rouge noirâtre. Sternites jaune rougeâtre; le septième est plus foncé. Peignes, opercule génital, sternum ocre-jaune; hanches et processus maxillaires rougeâtres. Pattes jaune rougeâtre avec quelques nuances des taches brunâtres. Pédipalpes châtain rougeâtre; doigts des pinces avec des tons rouge noirâtre. Chélicères rougeâtres avec une trame noirâtre.

Morphologie. Prosoma: plaque prosomienne avec le front très peu concave, presque droit. Tubercule oculaire antérieur par rapport au centre de la plaque prosomienne. Yeux médians séparés par 1,0 diamètre oculaire. Deux yeux latéraux, l'œil antérieur dirigé vers l'avant. Pas de granulations sur la surface de la plaque prosomienne, plutôt chagrinée. Mesosoma: tergites sans carènes, chagrinés également. Metasoma: anneaux I à IV avec quelques esquisses de carènes incomplètes; carènes dorsales plus marquées; carènes ventrales du cinquième anneau avec des granulations spiniformes; espaces intercarénaux très peu granulés; faces dorsales des anneaux IV et V légèrement granulées. Vésicule légèrement granulée. Sternites à stigmates ovales, presque arrondis. Peignes avec 7–6 dents (cf. Tableau II). Pédipalpes: fémur avec 4 carènes presque toutes complètes; tibia et pince avec quelques carènes esquissées, pince avec un tégument rugueux; présence de quelques granules épars. Doigt mobile avec 7–7 séries de granules, les accessoires très discrètes. Pattes avec la présence d'une rangée d'épines courtes sur la face ventrale des telotarses. Chélicères avec la dentition caractéristique des Chactidae (VACHON 1973). Trichobothriotaxie du type C, néobothriotaxie majorante (VACHON 1973).

Pas d'allotype ni des paratypes.

GENRE *Teuthraustes* Simon, 1878

Teuthraustes guerdouxi Lourenço, 1995

Cette espèce récemment décrite du Dept. Boyaca, Otanche-Muzo, est la seule connue du genre *Teuthraustes* pour la Colombie. Sa zone de distribution est assez éloignée du centre de différentiation du genre en Equateur (LOURENÇO 1995b). L'holotype mâle, l'allotype femelle ainsi que des paratypes sont déposés au Muséum d'histoire naturelle de Genève.

MATÉRIEL: Colombie, Dept. Boyaca, Otanche, IV/1986 (leg. Indiens de la mine de Muzo), l'holotype mâle, l'allotype femelle et 3 paratypes (1 mâle, 2 femelles).

CONSIDÉRATIONS SUR LA BIOGÉOGRAPHIE ET LA DIVERSITÉ DES ESPÈCES

Bien que certains points communs puissent être trouvés entre les modèles biogéographiques présentés par la faune des Scorpions de l'Equateur (LOURENÇO 1995c) et ceux présentés par la faune des Scorpions de Colombie, des caractéristiques faunistiques différentes sont exprimées. Ainsi on observera des éléments communs aux deux pays tels les Buthidae *Tityus asthenes et Tityus forcipula*, cependant aucune espèce de Chactidae n'est commune aux deux pays. L'Equateur avec une prédominance d'espèces appartenant au genre *Teuthraustes*, apparaît comme un centre de dispersion pour ce genre. de même que la Colombie avec une prédominance d'espèces appartenant au genre Chactas, constiturait le centre de dispersion de ce dernier. Pratiquement toute la faune des Buthidae à caractéristique andine encore présente en Equateur est remplacée en Colombie par des espèces très différentes. Ainsi aucune espèce du groupe «*Tityus bolivianus*» n'est présente en Colombie, tandis que celles du groupe «*Tityus melanostictus*» sont absentes d'Equateur.

Des éléments d'une faune méridionale, représentés par les familles des Bothriuridae et surtout des Iuridae sont encore présents en Equateur mais totalement absents de Colombie. Les apports d'une faune amazonienne sont également distincts en Equateur et Colombie. avec des espèces bien différentes pour des genres comme *Tityus* ou *Ananteris*. (e.g. *Tityus demangei*. *Tityus jussarae*. *Ananteris ashmolei* en Equateur et *Tityus blanci* et *Ananteris ehrlichi* en Colombie). Cette situation démontre un fort taux d'endémicité des espèces. Seules certaines espèces à très vaste répartition sur le bassin amazonien (e.g. *Tityus bastosi*), semblent être réparties sur les deux pays.

Si la Colombie ne présente pas d'éléments faunistiques méridionaux elle en possède d'autres. absents de l'Equateur. Des caractéristiques faunistiques provenant de l'hémisphère nord (région Caribo-centralaméricaine), se manifestent en Colombie avec la présence du genre *Centruroides* (aussi présente en Equateur) et celle du genre *Tarsoporosus* (les Diplocentridae eux absents de l'Equateur). Par contre, la présence des Ischnuridae (genre *Opisthacanthus*) en Colombie (absents de l'Equateur) est davantage la conséquence d'une actuelle répartition relictuelle du genre, car une deuxième espèce est présente dans le nord du Pérou et une troisième dans l'Amazonie orientale brésilienne.

Encore une caractéristique faunistique présente en Colombie et absente de l'Equateur est celle de la région nord péri-amazonienne. Ainsi des espèces du groupe «*Tityus clathratus*» telles *Tityus columbianus* et *Tityus tayrona* ont des affinités par cette voie du nord de l'Amérique du Sud avec des espèces présentes dans la région Guayana (LOURENÇO 1994b).

Globalement les faunes de l'Equateur et de Colombie, pays bien étudiés à présent, se caractérisent par des identités bien marquées. Depuis la Colombie et vers le Venezuela un remplacement graduel des éléments du genre *Chactas* par ceux des genres *Brotheas* et *Broteochactas* est observé. Ce modèle de remplacement continue jusqu'en Guayana et en Amazonie orientale. (GONZALEZ-SPONGA 1974; LOURENÇO 1994b) (Figs 58 à 61).

TABLEAU III.

DIVERSITÉ COMPARATIVE ENTRE LA FAUNE DES SCORPIONS DE COLOMBIE ET CELLES DE CERTAINS PAYS VOISINS.

Pays	Sup. Km^2	Nb. familles	Nb. genres	Nb. sp.	% sp. endé.
Equateur	270,670	4	8	36	66,7
Colombie	1,138,338	4	9	41	75,6
Panama	75,650	4	6	12	16,7
Costa Rica	50,700	4	7	13	38,5

Une estimation approximative de la diversité de la faune des Scorpions de Colombie peut être donnée, ainsi que cela a été fait pour la faune de l'Equateur (Lourenço 1995c). Il faut cependant tenir compte de l'état d'inventaire beaucoup plus avancé pour une faune telle que celle de l'Equateur. Pour cette raison, la faune colombienne ne semble présenter qu'une faible diversité pour un pays d'une surface presque six fois plus grande que celle de son voisin. A titre de comparaison, sont ajoutés dans le tableau II les valeurs connues pour le Panama et Costa Rica. Les résultats existant pour le Venezuela ne sont pas pris en compte, faute d'une réelle possibilité de vérification du contenu de cette faune, malgré les efforts de synthèse réalisés par Gonzalez-Sponga (1984).

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Genital morphology and systematics of *Geodipsas* Boulenger, 1896 (Reptilia: Serpentes: Colubridae), with description of a new genus

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Genital morphology and systematics of *Geodipsas* Boulenger, 1896 (Reptilia: Serpentes: Colubridae), with description of a new genus. - Hemipenes of the African colubrid snakes *Geodipsas depressiceps, G. procterae* and *G. vauerocegae*, and of the Malagasy species *Geodipsas heimi, G. infralineata* and *Alluaudina bellyi* are described. Moreover data on lepidosis and morphometry of these taxa are provided. By means of genital morphology, close affinities could clearly be demonstrated among the Malagasy *Geodipsas* species on the one hand, and among the African taxa on the other. In contrast to this, Malagasy *Geodipsas* spp. show distinct differences in hemipenis morphology as compared with the African species. We consider the deeply bifurcate sulcus spermaticus of the latter as derived; and suggest a monophyletic origin of the African taxa, which are transferred here to a new genus *Buhoma*. The Malagasy *Geodipsas* rather resemble hemipenially the externally different *Alluaudina*, but their relationships are still to be clarified.

Key-words: Reptilia - Serpentes - Colubridae - *Geodipsas* - *Alluaudina* - *Buhoma* gen. n. - genital morphology - systematics.

INTRODUCTION

The colubrid genus *Geodipsas* Boulenger, 1896 is presently regarded to contain the four Malagasy snake species *G. infralineata* (Günther, 1882), *G. boulengeri* (Peracca, 1892), *G. heimi* Angel, 1936, and *G. vinckei* Domergue, 1988, as well as the four taxa *Geodipsas depressiceps depressiceps* (Werner, 1897), *G. d. marlieri* Laurent, 1956, *G. procterae* Loveridge, 1922, and *G. vauerocegae* Tornier, 1902 from the African mainland (Glaw & Vences 1994, Rasmussen *et al.* 1995). The genus was erected by Boulenger (1896) for the Malagasy species *G. infralineata* and *G. boulengeri*; *G. infralineata* was later designated as the type species of the genus (Loveridge 1957).

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Malagasy *Geodipsas* are inhabitants of the eastern rainforest; *G. infralineata* is arboreal and nocturnal, whereas *G. heimi* and *G. vinckei* seem to be more terrestrial (GLAW & VENCES 1994, 1996 and unpublished observations). Of the African species, *G. vauerocegae* and *G. procterae* are restricted to mountain ranges in Tanzania (RASMUSSEN *et al.* 1995), whereas *Geodipsas depressiceps* inhabits forested regions of western central Africa (GUIBÉ 1958).

Next to marine snakes and the typhlopid genera *Typhlops* (9 endemic Malagasy species) and *Ramphotyphlops* (1 cosmopolitan species occurring in Madagascar), *Geodipsas* is the only snake genus which includes species from Madagascar as well as taxa from the African mainland. The remaining 19 genera occurring on Madagascar are endemic to the Malagasy region; they belong to the Colubridae (17 genera with 70 species) and to the Boidae (2 genera with 3 species; but see KLUGE 1991).

BRYGOO (1982) did not exclude the possibility that the monotypic Malagasy *Mimophis* represents actually a synonym of the Afro-Asiatic genus *Psammophis*. The problem of *Mimophis* relationships has not yet been satisfyingly resolved (see CADLE 1994). BRANDSTÄTTER (1995) discussed the available evidence regarding the status of *Mimophis*, and concluded that similarities to *Psammophis* may partly be due to parallel evolution of Malagasy and African snakes. He emphasized dentition (two instead of three diastemae), shape of loreal (not broader than high) and hemipenis length (relatively longer) as important differences between *Mimophis* and *Psammophis*.

In many groups of squamate reptiles, morphology and ornamentation of the hemipenes play an important role in diagnosing species and reconstruction of phylogenetic relationships (e.g. BÖHME 1988). At present, the hemipenial morphology of the following Malagasy colubrid species is known in detail: *Dromicodryas bernieri*, *Leioheterodon madagascariensis* (as *Anomalodon madagascariensis*) and *Langaha madagascariensis* (as *Langaha nasuta*) (COPE 1900); *Liopholidophis lateralis* and *Mimophis mahfalensis* (DOMERGUE 1962); *Liopholidophis infrasignatus* (as *L. thieli*) and *L. lateralis* (DOMERGUE 1972); *Liophidium apperti*, *L. trilineatum*, *L. therezieni* and *L. vaillanti* (DOMERGUE 1983); *Ithycyphus goudoti*, *I. miniatus*, *I. perineti* and *I. oursi* (DOMERGUE 1986); *Madagascarophis meridionalis*, *M. colubrinus septentrionalis*, *M. ocellatus* (DOMERGUE 1987); *Micropisthodon ochraceus* (DOMERGUE 1991); *Liopholidophis dolicocercus*, *L. epistibes*, *L. grandidieri*, *L. infrasignatus*, *L. lateralis*, *L. pinguis*, *L. rhadinaea*, *L. sexlineatus* and *L. stumpffi* (CADLE 1996) and *Liophidium torquatum* (ZIEGLER *et al.* 1996). Some data on hemipenial morphology are also known for the African species *Geodipsas depressiceps* (BOGERT 1940), *G. procterae* and *G. vauerocegae* (RASMUSSEN *et al.* 1995; also briefly mentioned in LOVERIDGE 1957).

In the present paper we describe the hemipenes of two Malagasy *Geodipsas* species (*G. infralineata* and *G. heimi*) in comparison with the African species up to now included in the genus (*depressiceps*, *vauerocegae* and *procterae*), and with the Malagasy *Alluaudina bellyi*. Additionally, external morphology and lepidosis of the involved taxa will be compared with each other, and with other Malagasy colubrid genera which we consider to be possibly related to *Geodipsas* (i. e. *Brygophis*, *Compsophis*). Our aim is to clarify the relationships between the African and Malagasy taxa currently assigned to *Geodipsas*. Throughout this paper, also in tables and figures, we follow the current use of generic names; taxonomic changes will be proposed in the chapter "Taxonomic conclusions".

MATERIAL AND METHODS

Specimens included in the present study are held in the collections of the following museums: MHNG - Muséum d'histoire naturelle, Geneva; SMF - Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt am Main; ZFMK - Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn; ZMUC - Zoological Museum, University of Copenhagen. Additional museum acronyms used are BM - The Natural History Museum, London; MRAC - Musée Royal de l´Afrique Centrale, Tervuren; ZMB - Zoologisches Museum der Universität, Berlin.

Collecting localities and related data of specimens used for hemipenial descriptions are given in the text; locality data of specimens studied for morphology and scalation are as follows. *G. depressiceps*: MHNG 1513.85 and 151389 Foulassi/Sangmelima, Cameroon; MHNG 1513.94 Kondémeyol, Cameroon; MHNG 1513.98 Djoum/Sangmelima, Cameroon; MHNG 1514.1 Kala/Yaoundé, Cameroon; 1514.3 Otomoto, Cameroon; 2031.81 A-D Territoire de Dekese, Kasai, Zaire. *G. infralineata*: ZFMK 62292 between Vohiparara and Ranomafana, eastern Madagascar; SMF 19572 Moramanga, eastern Madagascar. *G. vinckei*: ZFMK 59789 An'Ala near Andasibe, eastern Madagascar (juvenile specimen, possibly an immature female). Colour pictures of *G. vinckei* (ZFMK 59789) and *G. heimi* (ZFMK 59783) have recently been published by GLAW & VENCES (1996).

The recent development of a new technique (PESANTES 1994, ZIEGLER 1996) has made it possible to evert and study the hemipenes not only of fresh material, but also of specimens previously preserved in alcohol or even in formalin.

Abbreviations used in the text are as follows. SVL: snout vent length, from snout tip to beginning of cloaca; TaL: tail length, from end of cloaca to tail tip; HPL: hemipenis length, from apex to cloacal base point. Terminology of genital morphology follows KLAVER & BÖHME (1986) and BÖHME (1988). Other abbreviations in caption of table 1. We did not compare the total number of infralabials, since we had the impression that these were counted differently in the literature, and thus a reliable comparison with published data would not have been possible.

RESULTS

DESCRIPTION OF HEMIPENES

Geodipsas heimi Angel, 1936

ZFMK 59783 (SVL: 22; TaL: 4; HPL: 1 cm; freshly everted) from Andasibe (= Périnet, ca. 900 m above sea level), central eastern Madagascar, collected by F. Glaw 14. 1. 1995 (Fig. 1)

Fully everted hemipenes elongate. The pedicel, mainly on the upper asulcate surface, is covered with tiny spines. The apex is densely covered with small and slender spines that become stronger towards the truncus. The strong and elongate spines of the truncus form a broad ring which is on the asulcate surface medially interrupted by tiny spines. Two strong and elongate spines of different sizes can be found asymmetrically placed medially on the asulcate surface of the pedicel. The spineless and largely closed sulcus spermaticus is slightly bifurcate, the "branches" terminating in a heart-shaped configuration on the sulcate surface below the tip of the hemipenis.

Geodipsas infralineata (Günther, 1882)

SMF 32614 (SVL: 36,5; TaL: 12; HPL: 1 cm; everted after fixation) from Col Pierre Radama, near Maroantsetra, eastern Madagascar, collected by H. Bluntschli (Fig. 2).

There are only modest differences between the available hemipenial preparations of *G. infralineata* and *G. heimi*. The "branches" of the slight bifurcation of the sulcus spermaticus appear to be slightly longer in the hemipenis of *G. infralineata*. Also, the hemipenis of *G. infralineata* lacks distinct tiny spines on the asulcate surface of the pedicel, and, in relation to the snout vent length, the hemipenis of *G. heimi* is distinctly longer than that of *G. infralineata*.

Geodipsas depressiceps (Werner, 1897)

SMF 32613 (SVL: 22,5; TaL: 3,8; HPL: 0,8 cm; everted after fixation) from Victoria, Cameroon, collected by F. v. Bormann (Fig. 3).

Hemipenis, elongate and covered with sharp and partly strongly recurved spines. At the lower truncus a single ring consisting of enlarged spines, only interrupted by the sulcus spermaticus, separates the densely arranged and medium-sized spines of apex and truncus from the tiny spines of the pedicel. Not discernible from Fig. 3 there exist longitudinal truncal ridges of tissue (between fields of medium sized spines) that extend to the lower apex, covered with somewhat smaller spines (see also BOGERT 1940). The spineless sulcus spermaticus is bifurcate for about 2/3 of its length, with its slender branches leading straightly to the apex and terminating laterally just below the tip of the hemipenis.

The hemipenes of SMF 32613 correspond to those of MHNG 1513.85 from Foulassi, Sangmelima, Cameroon (SVL: 21,5 TaL: 3,9; HPL: 0,7 cm) and to the only partly preserved organs of MHNG 2031.81A from Dekese, Kasai, Zaire (SVL: 20,5; TaL: 4 cm), which also have been everted from previously preserved specimens.

Geodipsas procterae Loveridge, 1922

ZMUC R631174 (SVL: 32; TaL: 9; HPL: 1,4 cm; everted after fixation) from Udehuva, Mount Nyumbanitu, Uzungwa mountains, Tanzania (Fig. 4).

Hemipenis elongate, slightly curved towards the central axis of the snake. The pedicel is covered with tiny spines, truncus and apex are densely covered with strong and stout spines of approximately the same length. The largely closed and spineless sulcus spermaticus is bifurcate for about 1/2 of its length, with the branches terminating laterally below the tip of the hemipenis (see also RASMUSSEN *et al.* 1995).

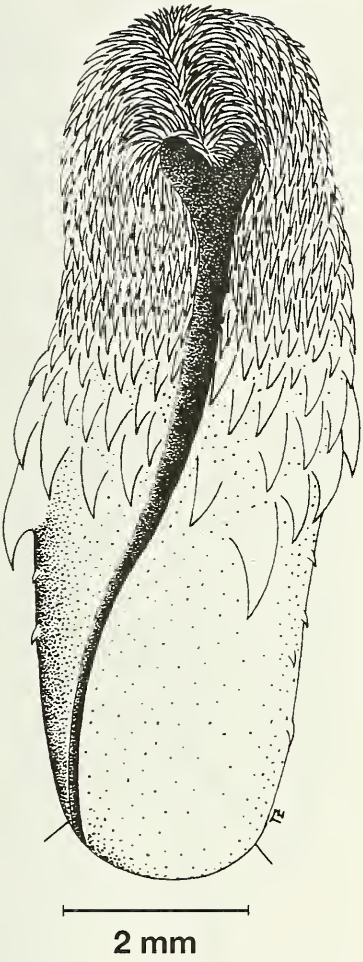

FIG. 1: Sulcal view of the left hemipenis of *Geodipsas heimi* (ZFMK 59783). - FIG. 2: Sulcal view of the left hemipenis of *Geodipsas infralineata* (SMF 32614).

Geodipsas vauerocegae Tornier, 1902

ZMUC R63907 (SVL: 23; TaL 4,5; HPL: 0,8 cm; everted after fixation) from Amani, east. Usambara mountains, Tanzania.

There is a strong similarity between the hemipenis of *G. procterae* and the smaller ones of *G. vauerocegae* (see also RASMUSSEN *et al.* 1995), but in *G. vauerocegae* the tiny spines of the pedicel are somewhat stronger and more elongate than in *G. procterae*.

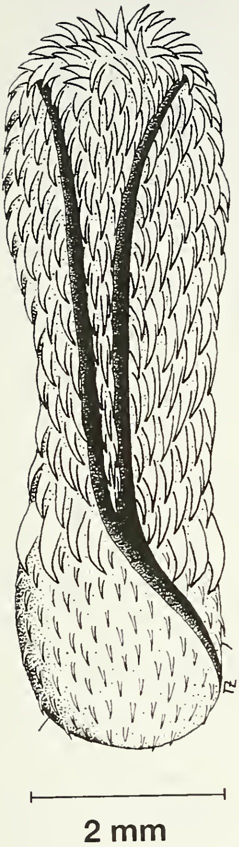

FIG. 3: Sulcal view of the right hemipenis of *Geodipsas depressiceps* (SMF 32613). - FIG. 4: Sulcal view of the left hemipenis of *Geodipsas procterae* (ZMUC R631174).

Alluaudina bellyi Mocquard, 1894

ZFMK 59799 (SVL: 26,5; TaL: 10; HPL: 0,6 cm; freshly everted) from Strict Nature Reserve ("Reserve naturelle Integrale") Marojezy, Camp 1 (ca. 300 m above sea level), north-eastern Madagascar, collected by F. Glaw 22.2.1995 (Fig. 5).

Fully everted hemipenes slightly elongate, terminally curved towards the sulcate surface. Apex and truncus are densely covered with slightly recurved and delicate spines, which also surround the sulcus spermaticus on the pedicel. On the lower truncus the spines become stronger and more elongate, only on the asulcate surface medially there is a spineless area, which is at a time laterally restricted by two broad and strong spines which are connected to each other. Not discernible from Fig. 5 are the laterally slightly lengthwise folded apex and upper truncus. The spineless

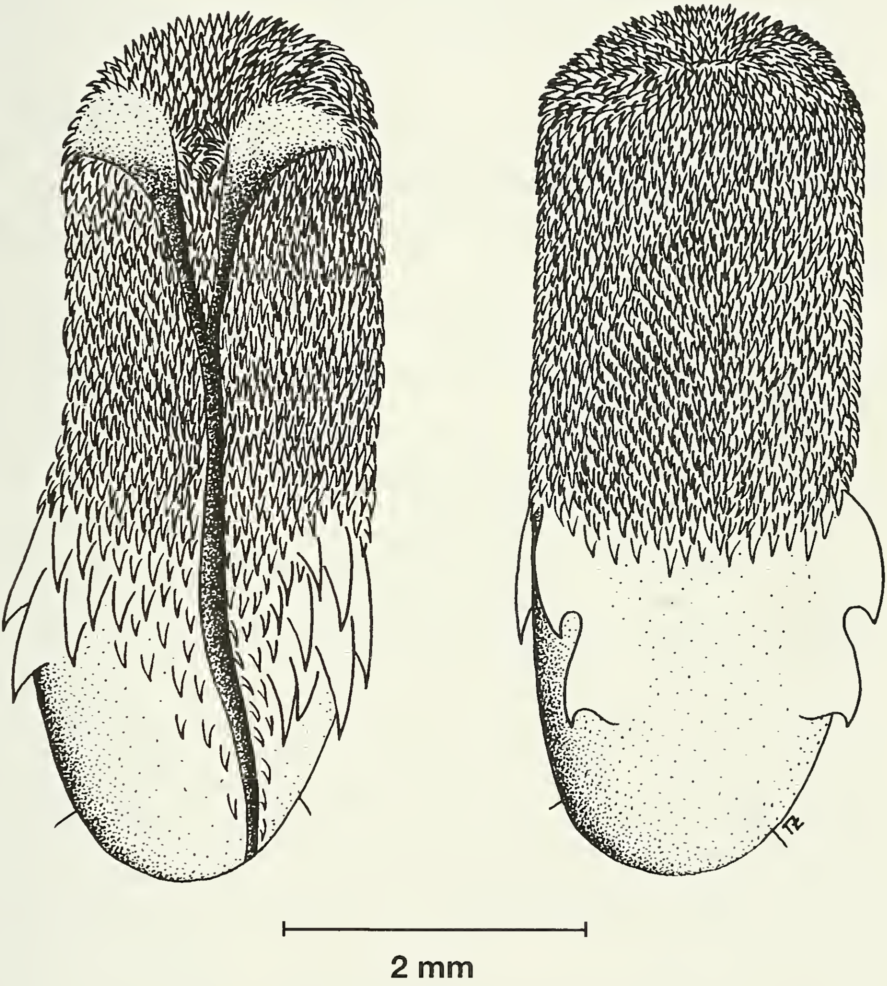

FIG. 5: Sulcal (left) and asulcal (right) view of the right hemipenis of *Alluaudina bellyi* (ZFMK 59799).

and largely closed sulcus spermaticus is slightly bifurcate for about 1/3 of its length, with the branches terminating laterally in spineless extensions on the sulcate surface far below the tip of the hemipenis.

Scalation and morphology - comparison between African and Malagasy species

Table 1 gives measurements and scale counts of the specimens examined in the present study, compared with the respective type descriptions. Table 2 summarizes metric and meristic data of all species considered. A direct comparison between African and Malagasy taxa gives the following results:

Size.- African species included in *Geodipsas* are relatively small snakes (up to 520 mm total length). The same is true for all Malagasy *Geodipsas* except *G. infralineata* (ca. 790 mm total length in the type).

Relative tail length.- The tail is relatively short (less than 20% of total length) in all African taxa assigned to *Geodipsas*. The same is true for Malagasy *Geodipsas* except *G. infralineata*.

Number of ventral scales.- African *Geodipsas* have a rather low number of ventrals in common (122-163), with clear differences between some taxa. In Madagascar, most species have a low number of ventrals but a higher number (up to 191) is found in *G. infralineata*.

Number of dorsal scales.- Most of the African taxa (*procterae*, *vauerocegae* and *marlieri*) have 17 rows of dorsal scales. whereas *depressiceps* has 19 rows (17 in one specimen). All Malagasy *Geodipsas* have 19 rows.

Pre- and postoculars.- African *Geodipas* have 2 preoculars (1 in *vauerocegae*). All Malagasy species have only 1 preocular (2 preoculars on one side of the head in one specimen of *G. infralineata*). Most African and Malagasy taxa have 2 postoculars (the upper postocular is mostly larger than the lower), but single specimens of several species have 3 postoculars.

Temporals.- The configuration of the temporals can be used to distinguish the African species from all Malagasy snake species considered, although the distinction is not as consistent as would be necessary for a diagnostic or phylogenetically valuable character. The African species have mostly 1+2 temporals (1+3 in some *G. depressiceps*), and the upper temporal scale of the second row is mostly longer (and thus reaching further posteriorly), often about twice as long as the lower scale. This was observed (at least on one head side) in 10 out of 12 *G. depressiceps*, and can be seen in the pictures of the holotypes of *G. vauerocegae* and *G. procterae* shown by Rasmussen *et al.* (1995).

A similar character state was not observed in any Malagasy specimen. These have either 1+1 (*G. vinckei*). 2+2 (one head side of one *G. heimi* and one *G. infralineata*). or 1+2 temporals with the lower scale in the second row reaching further than the upper scale. The latter situation is observed in one *G. heimi* in table 1 and in *G. infralineata*: two specimens in table 1 as well as the drawing in the original

TABLE 1: Measurements and lepidosis of the studied specimens. For a better comparison, data of the corresponding type descriptions are also given. These are taken out of WERNER (1897) for *Geodipsas depressiceps*, of DOMERGUE (1988) for *Geodipsas vinckei*, of ANGEL (1936) for *G. heimi* and of GUIBÉ (1958) for *Alluaudina bellyi*. Question marks: Values not given in the original description, or values not recognizable due to bad preservation of specimen.
Abbreviations used are: **Sex**: Sex of the specimen, either F (female) or M (male). **SVL**: length of head and body in mm. **TaL**: length of tail in mm. **D**: number of dorsal scale rows counted at midbody. **V**: number of ventral scales. **SC**: number of subcaudals. **SC div.**: Subcaudals divided (= in pairs), yes/no. A: anal scale single (1) or divided (2). **PreOc**: number of preoculars. **PostOc**: number of postoculars. **Temp**: formula for first two rows of temporal scales. **Temp config**: refers to the second row of temporal scales; mentioned is which of the temporals in this row reaches furthest posteriorly (in most cases the furthest reaching scale is also the longest); + means that the corresponding scale is much longer than the other scale(s) (generally about twice as long); l/r refers to left and right side of the head. Values are only given with Temp formulas 1+2 or 1+3. **SupLab**: number of supralabials. **SupLab (eye)**: supralabials entering the eye. **InfLab (Subl)**: number of infralabials in contact with anterior pair of sublinguals. **Sublin (large)**: number of regular pairs of large sublingual scales. **Sublin (small)**: number of irregular small scales interposed between large sublinguals and ventrals.

Nr.	Sex	SVL	TaL	D	V	SC	SC div.	A	PreOc	Post-Oc	Temp	Temp config	SupLab	SupLab (eye)	InfLab (Subl)	Sublin (large)	Sublin (small)
G. depressiceps																	
type description		287-243	34-44	19	144-151	35	?	1	2	2	1+2	?	7	3,4	4	?	?
MHNG 2031.81A		?	?	19	?	?	?	?	?	?	1+2	r:upper+; l:equal	7	3,4	4	3	0
MHNG 2031.81B		209	36	19	147	33	Yes	1	2	2	1+2	r:upper+; l:upper	7	3,4	4	3	0
MHNG 2031.81C		193	32	19	147	34	Yes	1	2	2	1+2	r:upper+; l:upper	7	3,4	4	3	0
MHNG 2031.81D		220	39	17	141	33	Yes	1	2	2	1+2	upper+	7	3,4	4	3	0
MHNG 1513.85	M	213	40	19	143	33	Yes	1	3	2	1+3	not upper	7	3,4	4	3	0
MHNG 1513.89	F	193	37	?	143	36	Yes	?	?	?			?	?		?	?
MHNG 1513.94	M	186	34	19	143	40	Yes	1	3 (right)	?	1+2	l:upper	?	3,4	4	3	0
MHNG 1513.98	M	220	44	19	ca. 135	37	Yes	1	2	2	1+3	l:upper	7	3,4	4		
MHNG 1514.1	F	222	37	19	ca. 147	32	Yes	1	2	2	1+2	upper+	7	3,4	4	3	0
MHNG 1514.3	M	177	33	19	134	34	Yes	1	?	?	1+3	not upper				2	1
ZFMK 5824	F	254	40	19	142	31	Yes	1	2	2	1+2	upper+	7	3,4	4	3	0
SMF 19574		225	44	19	144	38	Yes	1	2	2	1+2	upper	7	3,4	4	3	0
SMF 32613	M	218	39	19	138	ca.36	Yes	?	2	2	1+2	upper+	7	3,4			
G. infralineata																	
type description		635	152	19	186	62	?	1	1	2	1+2	lower	7	3,4		?	?
ZFMK 62292	F	398	108	19	177	63	Yes	1	2/1	2	1+2	lower	7	3,4	4	2	ca. 5
SMF 32614	M	345	121	19	185	80	Yes	?	1	2	2+2		7	3,4	3	3	ca. 5
SMF 19572	F	540	131	19	189	66	Yes	1	1	2	1+2	lower	7	3,4	4	2	2
G. vinckei																	
type description		411	84	19	163	45	Yes	1	1	3	1+1		7	3,4	4	2	5
ZFMK 59789	F?	172	31	19	152	38	Yes	1	1	2	1+1		7	3,4	4	2	2
G. heimi																	
type description	?	280	55	19	134	34	?	1	1	2	1+2		7	3,4	?	?	?
ZFMK 59783	M	220	40	19	133	30	Yes	1	1	2	2+2/1+2	lower	7	3,4	4	2	ca. 6
Alluaudina bellyi																	
type description		293	73	25	161	68	No	1	2	3	many		8	4,5	4-5	?	?
ZFMK 59799	M	269	98	25	163	78	No	1	2	3	many		8	4,5	6	3	3

description and two specimens pictured by GLAW & VENCES (1994: plate 336 and fig. 515). Also the other Malagasy genera considered differ from the African taxa: In *Alluaudina* no regular temporals can be identified; the corresponding place is made up by numerous small scales. *Compsophis* has a configuration of 2+3; and *Brygophis*, following the drawing of DOMERGUE (1988) has the lower scale in the second row reaching further than the upper scale.

Supralabials.- *G. depressiceps*, *G. d. marlieri* and *G. vauerocegae* have 7 supralabials, whereas *G. procterae* has 8 supralabials (third, fourth, and fifth entering the eye). All Malagasy *Geodipsas* have 7 supralabials, of which the third and fourth enter the eye. *Alluaudina* has 8 supralabials, but only fourth and fifth are entering the eye, the state is thus possibly not homologous to the state in the African *procterae*.

Infralabials.- A difference is found in the number of infralabials that contact the first pair of sublinguals. These are 4 in most taxa, but 3 in *G. d. marlieri* and in most *G. vauerocegae*. 5-6 infralabials contact the first sublinguals in *Alluaudina*.

Sublingual scales.- The configuration of the sublingual scales can be used to separate most African specimens from the Malagasy taxa. In 9 out of 10 *G. depressiceps* there are three regular pairs of longish sublingual scales; behind these the ventral scales immediately begin. The same situation can be observed in the holotype of *G. vauerocegae*, whereas the holotype of *G. procterae* has some (rather large) scales irregularly interposed between the two pairs of large sublinguals and the beginning of the regular ventral scales (figs. in RASMUSSEN *et al.* 1995). In contrast, the Malagasy *Geodipsas* have only two large pairs of sublinguals, and a varying number of small irregular scales are interposed between these and the beginning of the ventrals. A similar situation is also found in *Brygophis* and *Alluaudina*.

Other scalation characters.- Several other characters exhibit variation within the snake species considered in the present study. *Alluaudina* has strongly keeled dorsal scales, a character shared with *G. depressiceps* from Africa. However, scale ultrastructures of these species are completely different (own unpublished data), indicating that the keeled states are not homologous. *G. boulengeri* is unique in having two loreal scales. *G. procterae* has undivided subcaudals, a character state shared with *Alluaudina*.

Maxillary teeth.- Number of maxillary teeth is 17-19+II in *G. vauerocegae* and *G. procterae* (mean 18.1 and 17.8, N = 38 and 13, respectively; RASMUSSEN *et al.* 1995, Rasmussen pers. comm.), 15-18+II in *G. depressiceps* and *G. infralineata* (mean 16.2 and 16.3, N = 13 and 4, respectively; Rasmussen, pers. comm.), and 12+II in *G. vinckei* (DOMERGUE 1988).

DISCUSSION

HEMIPENIS MORPHOLOGY

A comparison of the hemipenes described in the present study indicates that the affinities between the African taxa *Geodipsas depressiceps*, *G. procterae*, and *G. vauerocegae* are much closer than those of any of these taxa to the Malagasy species.

TABLE 2: Differential characters between the species considered in the present study. Data of *Geodipsas vauerocegae* and *G. procterae* from RASMUSSEN et al. (1995); details of sublinguals and temporal conformation from pictures of *vauerocegae* and *procterae* holotypes in RASMUSSEN et al. (1995). Data of *G. d. depressiceps* from table 1 and LAURENT (1956). Data of *G. d. marlieri* from LAURENT (1956) and DERLEYN (1978). Data of *G. infralineata* from table 1 and GUIBÉ (1958). Data of *G. boulengeri* from PERACCA (1892); details of temporal conformation from the corresponding drawing of the holotype. Data of *Compsophis albiventris* from MOCQUARD (1894) and drawings of GUIBÉ (1958). Data of *Brygophis coulangesi* from DOMERGUE (1988). Data of *Alluaudina mocquardi* from GUIBÉ (1958) and LANZA (1990). Data of *Alluaudina bellyi* from table 1 and GLAW & VENCES (1994). Other data from table 1. Abbreviations as in table 1 except for **TL** (maximum total length in mm), **TaL%** (relative tail length in % of total length). **TL**, **TaL%**, and **SC** are given seperately for males (M) and females (F) when data were available. For **TaL%**, **V**, and **SC** we give the range of observed values. For other characters we give the value which was most often observed, followed (in brackets) by other observed values (except **Temp config**). The **Temp** formula of *Compsophis albiventris* could not be ascertained since the drawing of GUIBÉ (1958) differs from the formula 1+2 given in the description. Several character states of *G. d. marlieri* (**PreOc**, **PostOc**, **Temp**, **SupLab**) are not totally reliable since LAURENT (1956) only mentioned characters which are distinct to *G. d. depressiceps*.

	TL	TaL%	V	SC	SC div.	D	Pre-Oc	Post Oc	Temp	Temp config	Sup Lab	SupLab (eye)	InfLab (subl)	Sublin (large)	Sublin (small)
G. d. depressiceps	278 (M) 333 (F)	16-19 (M) 13-15 (F)	134-148	37-40 (M) 31-37 (F)	Yes	19 (17)	2 (3)	2	1+2 (1+3)	upper	7	3,4	4	3 (2)	0 (1)
G. d. marlieri	433 (M) 443 (F)	15-18 (M) 13-14 (F)	150-164	37-44 (M) 35-37 (F)	Yes	17	2 (?)	2 (?)	1+2 (?)	?	7 (?)	3,4 (?)	3	?	?
G. vauerocegae	320 (M) 410 (F)	?	122-133	38-48 (M) 35-41 (F)	Yes	17	1 (2)	2 (1)	1+2	upper	7 (8)	3,4 (4,5)	3 (4)	3	0
G. procterae	440 (M) 520 (F)	?	143-154	43-50 (M) 33-39 (F)	No	17	2 (3)	2 (3)	1+2	upper	8	3,4,5	4	2	3
G. infralineata	787	20-26	159-191	43-81	Yes	19	1 (2)	2	1+2	lower (2+2)	7	3,4	4	2 (3)	2-5
G. heimi	335	15-16	133-134	30-34	Yes	19	1	2	1+2	lower (2+2)	7	3,4	4	2	ca. 6
G. vinckei	495	15-17	152-163	38-45	Yes	19	1	2-3	1+1	only one present	7	3,4	4	2	2-5
G. boulengeri	348	?	137	31	Yes	19	1	2-3	1+2	lower	7	3,4	?	?	?
Compsophis albiventris	167	?	148	41	Yes	19	1	2	1+2/	equal? 2+X?	7	3,4		?	?
Brygophis coulangesi	1203	19	204	73	Yes	19	1	3	1+2	lower	7	3,4	4	2	6
Alluaudina bellyi	447	27	153-163	57-78	No	25	2	3	many (3+3?)	too many present	8	4,5	6	3	3
Alluaudina mocquardi	500	22-25	202-205	91-98	No	24-25	3	4	many (3+3?)	too many present	8	4,5	5	3	2

Within the African species (except for *Geodipsas depressiceps*), as well as within the Malagasy *Geodipsas*, it is quite difficult to distinguish species relying solely on genital morphology; on the contrary, there are clear distinctive features between the hemipenes of the African and the Malagasy snakes considered.

One of the most important differences between the African and Malagasy taxa is the deeply bifurcate sulcus spermaticus of the former. In colubrid snakes divided sulci and bilobed hemipenes are often considered as plesiomorphic condition (e.g. UNDERWOOD 1967; MYERS & CADLE 1994). However, arguments exist also to consider simple organs with undivided sperm grooves as primitive compared with divided ones (e.g. BÖHME 1988; BÖHME & SIELING 1993). The deep bifurcation found in African *Geodipsas* may therefore be a synapomorphic trait.

On the other hand, we regard the more heterogeneous spine ornamentation on the hemipenes of the Malagasy *Geodipsas* as derived. The spines of the pedicel are reduced to a large extent, or partially existing as tiny spines. The small and slender spines of the apex gradually become larger towards the lower truncus. The latter contrasts with the state in *G. depressiceps*, which (also concerning the deeply bifurcate sulcus and the truncal ridges of tissue) seems to be the most derived of the African taxa, and in which there is only a single and continuous ring of elongate spines on the truncus. The hemipenes of *G. procterae* and *G. vauerocegae* are characterized by a largely plesiomorphic, nearly complete spine ornamentation, only differentiated in tiny spines of the pedicel and stronger ones of truncus and apex.

Furthermore, and contrasting with the African species, the asulcate surface of the lower truncus of the hemipenes of the Malagasy *Geodipsas* species bears an interruption of the elongate, strong spines, which is filled up by tiny spines. Just medially at the pedicel there are two isolated strong spines on the asulcate surface, absent in the African species.

Since the hemipenes of a representative of the genus *Alluaudina* are available for the first time in detail, first hypotheses on possible affinities can be drawn. There are several hemipenial features which *A. bellyi* has in common with *Geodipsas heimi* and *G. infralineata*: (a) the small and reduced spines of apex and upper truncus, (b) the enlarged spines of the lower truncus, which are medially interrupted on the asulcate surface, and (c) the only slightly bifurcate sulcus, with its short branches terminating far below the tip of the hemipenis. Thus it can be stated that regarding hemipenis morphology Malagasy *Geodipsas* exhibit closer affinities to *Alluaudina bellyi* than to the externally more similar African taxa.

SCALATION

Scale characters do not unequivocally differentiate the African from the Malagasy *Geodipsas*. Nevertheless, some character states (configuration of temporals and sublinguals) similar within all or most African taxa are not or seldom found in Malagasy species, which on the other hand are rather heterogeneous regarding these characters. The number of dorsal scale rows, on the contrary, is not variable in Madagascar (except the rather distinct *Alluaudina*), but different in three African taxa (and in one specimen of the remaining African taxon *depressiceps*). Three out of four

African taxa have 2 preoculars, a situation not found in Malagasy *Geodipsas* (only in *Alluaudina*).

No set of characters could be identified which would clearly disrupt the uniformity of the African taxa by grouping one of them nearer to the Malagasy taxa than the others: *depressiceps* has 19 dorsal scale rows as the Malagasy species, but has very distinctly the "African" state of temporals and sublinguals; *procterae*, which has (in the holotype) a sublingual conformation similar to the "Malagasy" state and 8 supralabials (similar but not identical to the Malagasy *Alluaudina*), has 17 dorsal scale rows and an "African" temporal configuration; *vauerocegae* which has only one preocular like the Malagasy *Geodipsas* has 17 dorsals and "African" configurations of temporals and sublinguals.

We did not undertake a phylogenetic polarization of the character states identified in lepidosis; this would have been clearly premature in such variable characters without a more extensive analysis of colubrid snakes to identify suited outgroups. Nevertheless we conclude that phenetically there are obvious relationships between the four African taxa, and that data from lepidosis do not contradict the hypothesis that they represent a monophyletic unit.

TAXONOMIC CONCLUSIONS

Description of a new genus

The distinct differences in hemipenis morphology indicate generic distinctness of the Malagasy *Geodipsas* from the African taxa so far included in the genus. Similar arguments have previously proved to be useful for splitting several heterogeneous snake genera into units that reflect more correctly phylogenetic relationships, e. g. Rossmann & Eberle (1977) of the genus *Natrix*, Dowling & Fries (1987) and Dowling & Prices (1988) of the genus *Elaphe*, Gloyd & Conant (1990) of the genus *Agkistrodon*, and Myers & Cadle (1994) of the genus *Rhadinaea*; certainly some further revisions will follow (e.g. Böhme & Ziegler in prep. regarding the genus *Coronella*).

Since the African taxa were all originally described as belonging to already named genera with defined type species (*Geodipsas: vauerocegae, procterae, marlieri; Tropidonotus: depressiceps*), no generic name is available to group the African taxa into a genus separate from *Geodipsas*; a new generic name is therefore needed and will be proposed below.

The separation of the African taxa from *Geodipsas* on the genus level is further corroborated by recent studies of Wollberg, Kochva & Underwood (in prep.) on rictal glands in *Atractaspis*, *Geodipsas*, and aparallactine snakes. Following this study (Underwood, pers. comm.), the taxa *depressiceps*, *vauerocegae* and *procterae* "have sequential supralabial, Duvernoy´s and superior rictal glands and also inferior rictal glands like *Aparallactus*. [...] In this condition they contrast with *Geodipsas infralineata*, the type species of the genus. This suggests that the African species are 'aparallactines' and are wrongly assigned to the genus *Geodipsas*".

Based on these arguments we transfer the African species previously assigned to *Geodipsas* to a new genus, for which we coin the name

Buhoma gen. n.

Type species.- *Geodipsas vauerocegae* Tornier, 1902. We designate this taxon as type species since it was recently reviewed in detail, and its holotype illustrated (Rasmussen *et al.* 1995). The holotype is a male specimen collected by Dr. Küttner in East Usambara mountains; ZMB 17557; photographs of holotype in Rasmussen *et al.* (1995).

Etymology.- Buhoma is the vernacular name by which *B. depressiceps marlieri* is known in the Musigati region, Burundi (Derleyn 1978); we here define its gender as feminine.

Diagnosis.- Distinguishable from *Geodipsas* by deep bifurcation of sulcus spermaticus, and by combination of configuration of (a) sublinguals and (b) temporals (see above). Following Bogert (1940) a distinction from all other African colubrid genera is possible by combination of (a) presence of hypapophyses on the posterior vertebrae, (b) grooved posterior maxillary teeth, (c) sulcus spermaticus forked.

Description.- Small forest snakes (maximum known total length 520 mm) with round pupils. 17-19 dorsal scale rows; 122-163 ventrals; anal undivided; subcaudals single or in pairs, 31-50; 7 or 8 supralabials (third and fourth or fourth and fifth in contact with eye); generally one or two (exceptionally three) preoculars and two (exceptionally one or three) postoculars. Temporals 1+2; upper temporal of second row generally longest. 15-19+II maxillary teeth. Rictal gland configuration similar to that in *Aparallactus* (Underwood pers. comm.). For a detailed description of skull characters of *B. depressiceps* see Bourgeois (1968). Hemipenis simple and elongate. Pedicel covered with tiny respectively small and slender spines, truncus and apex densely covered with strong and stout resp. recurved spines, which can form a single ring of elongate spines at the lower truncus; there can exist longitudinal truncal ridges of tissue, covered with small spines. Sulcus spermaticus without spines, bifurcate for about 1/2 to 2/3 of its length, with the branches terminating laterally below the tip of the hemipenis.

Species included.- *Buhoma vauerocegae* (Tornier, 1902); *Buhoma procterae* (Loveridge, 1922); *Buhoma depressiceps* (Werner, 1897); *Buhoma depressiceps marlieri* (Laurent, 1956). The latter taxon may deserve specific status.

Distribution.- Central Africa. *B. vauerocegae* is known from the Usambara, Magrotto, and Uluguru mountain ranges, whereas *B. procterae* inhabits the Uluguru and Udzungwa mountain ranges, all in Tanzania (Rasmussen *et al.* 1995). The distribution map in Rasmussen *et al.* (1995) shows an additional locality of the latter species in the eastern Usambara mountain range; at this locality, as well as in the Uluguru mountain range, *B. vauerocegae* and *B. procterae* occur sympatrically. Type locality of *procterae* is 3 miles from Morogoro, Uluguru mountains (holotype BM 1946.1.248; photographs of holotype in Rasmussen *et al.* 1995). *B. d. depressiceps* has a wider distribution in western central Africa. Type locality is "Barombi-Station" in Cameroon (Werner 1897; original description based on two syntypes, deposited in the ZMB). Other localities are in the People's Republic of Congo (Dimonika region; Trape 1985); Equatorial Guinea (Macias Nguema = Fernando Poo; Capocaccia 1961); Cameroon (e. g. specimens in Tab. 1); Zaire (e. g. specimens in Tab. 1 and localities in Laurent 1956). *B. d. marlieri* was described from Mwana, terr. de Mwenga (Kivu) in Zaire (Laurent 1956) and is also known from other localities in Zaire (see Laurent 1956); Burundi (Musigati, Bubanza province; Derleyn 1978); Uganda (Kalinzu; Pitman 1974 fide Derleyn 1978).

B. vauerocegae and *procterae* occur in mountain ranges; *B. procterae* occurs at least as high as 2140 m (Rasmussen *et al.* 1995). *B. d. marlieri* is also restricted to higher altitudes, and in Zaire is not known from altitudes lower than 1300 m (Laurent 1956). *B. d. depressiceps*, on the other hand, is known from lower elevations: 500-600 m on Macias Nguema (Fernando Poo), but also seems to reach higher altitudes (up to 2000 m; specimen [not examined] MRAC 76003.0221 from Zaire; Meirte, pers. comm.).

Biology.- As far as known, *Buhoma* are terrestrial snakes (Rasmussen *et al.* 1995; Trape 1985). *B. vauerocegae* seems to prefer rainforest habitats. It was found on the forest floor, and was demonstrated to feed on anurans. *B. procterae* occurs in forest and thick bush country, and a frog specimen (*Hoplophryne*) was identified as prey. These two species seem to be oviparous. The respective data sources are found in Rasmussen *et al.* (1995); these authors suggest that *vauerocegae* and *procterae* may be predominantly diurnal species.

Following Trape (1985) also *B. depressiceps* is terrestrial. One frog (*Arthroleptis variabilis*) was found in the stomach of one *depressiceps* specimen according to Werner (1899), remains of a *Phrynobatrachus* in another specimen according to Laurent (1956). The latter author stated that *B. d. marlieri* lives under leaf litter and grass, in the vicinity of swamps and ponds. Derleyn (1978) collected *B. d. marlieri* from Burundi near brooks in forest. The author pointed out that specimens were extremely fragile and did not accept amphibian prey in captivity.

Systematic relationships of *Buhoma*

The position of *Geodipsas* within the framework of African colubrid systematics has always been isolated. Bogert (1940) placed the genus as only member into his phenetic group III. Parker (1949), partly relying on Bogert (1940), postulated close relationships with the monotypic Sokotran genus *Ditypophis*, but it seems that he confused hemipenial data attributing *Geodipsas* a bilobed hemipenis. In any case *Ditypophis* clearly differs in dentition from *Geodipsas* (see Parker 1949). Underwood (1967) mentioned the similarity of *Geodipsas* with some opistoglyphe genera of Bogert's group VII. All these authors understood *Geodipsas* as including the African taxa, and thus their considerations are also true for the new genus *Buhoma*. Several of Bogert's genus groups have been corroborated by phylogenetic studies, but others do not seem to be monophyletic assemblages (see Cadle 1994). *Geodipsas* was not included in recent immunological studies (Cadle 1994), and thus the systematic relationships of *Geodipsas* s. str. and *Buhoma* remain enigmatic. New, comprehensive studies are needed before their relationships with other African and Malagasy taxa can be clarified.

Our decision of anticipating the description of the new genus *Buhoma* to the urgently necessary further clarification of colubrid systematics is also based on the renewed interest in the herpetofauna of Madagascar and its biogeographic origins. We wish to emphasize that our data do not support any sistergroup relationships between African and Malagasy colubrid taxa below the genus level, and that no biogeographic conclusion should be based on the former classification - implying close relationships - of African and Malagasy taxa belonging to a single genus *Geodipsas*.

SYSTEMATICS OF THE MALAGASY *Geodipsas*

Beside the generic partition of the African and Malagasy taxa until now assigned to *Geodipsas*, a nomenclatural problem exists regarding this generic name. The genus *Geodipsas* was created in 1896 by BOULENGER for two species from Madagascar, namely *Tachymenis infralineatus* and *Tachymenis boulengeri*. Two years before, MOCQUARD (1894) had erected the genus *Compsophis* for a single specimen of a new snake species from Montagne d`Ambre (northern Madagascar), which he named *Compsophis albiventris*. In contrast to *Geodipsas* this genus was considered as aglyphous (GUIBÉ 1958) and thus both genera were not thought to be related. Nevertheless, number and relative size of maxillary teeth of both, as given by GUIBÉ (1958), seem to be similar (GLAW & VENCES 1994), and by external morphology no characters are known which would allow a distinction of the single known *Compsophis* specimen from *Geodipsas heimi*, which was described by ANGEL in 1936. In fact, RAXWORTHY & NUSSBAUM (1994) found *G. heimi* at the *Compsophis* type locality Montagne d'Ambre. If, by future studies, *Compsophis albiventris* is found to to be congeneric to *Geodipsas*, or even to be a senior synonym of *Geodipsas heimi*, the generic name *Geodipsas* must be considered a junior synonym of *Compsophis*. On the other hand, the type species *G. infralineata* differs considerably from the remaining Malagasy *Geodipsas* species but is phenetically similar to *Brygophis* (Tab. 2). One specimen (ZFMK 17740) from Madagascar, which was not considered in the present paper, shows characters of *Brygophis coulangesi* and of *Geodipsas infralineata*. It possibly represents a new species which, at present, can not clearly be assigned to either *Geodipsas* or *Brygophis*. Recent descriptions of numerous new colubrids from Madagascar (e. g. DOMERGUE 1995, CADLE 1996) as well as the existence of several undescribed species identified by us in the ZFMK collection (e.g. GLAW & VENCES 1996) demonstrate the lack of knowledge regarding this group. Further studies are needed to assess the status of the genera *Geodipsas*, *Compsophis*, and *Brygophis*.

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NOTE ADDED IN PROOF

While the present paper was in press, another extensive study on *Geodipsas* systematics was published [CADLE, J. E. 1996: Systematics of snakes of the genus *Geodipsas* (Colubridae) from Madagascar, with descriptions of new species and observations on natural history. Bulletin of the Museum of comparative zoology 155(2): 33-87]. Basically, CADLE's data are in accordance with ours, but he applies several taxonomic modifications at the species level which should be mentioned here: (1) He describes two new species from Madagascar (*G. laphystia* and *G. zeny*); the former is most similar to *G. infralineata*, what partly explains our observations on large intraspecific variability in that taxon. Of the specimens studied by us, ZFMK 62292 and probably SMF 32614 belong to *G. laphystia*. (2) He synonymizes *G. heimi* with *G. boulengeri*; throughout our paper, the name *G. heimi* should therefore be changed to *G. boulengeri*.

CADLE provides hemipenial data for additional specimens of all species studied by us, and for two additional Malagasy species (*G. laphystia*, *G. zeny*). His data strongly support our conclusions by corroborating the hemipenial differences between *Geodipsas* and *Buhoma*. CADLE himself concludes "that improved clarity of the uncertainty surrounding relationship of the Malagasy species of *Geodipsas* is best served by removing the African species to another genus (...)." However, he defers "specific nomenclatural action to a future report" since he considers the hemipenial features of the African species (largely divided sulcus) as not derived. He also emphasizes the hemipenial differences between *B. depressiceps* on one hand and *B. procterae* and *B. vauerocegae* on the other (e.g. ring of hooked basal spines in the former), which we regard as less relevant.

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Oribatids from Madagascar III. (Acari: Oribatida). (*Acarologica Genavensia* LXXXIII)[1]

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Oribatids from Madagascar III. (Acari: Oribatida). (*Acarologica Genavensia* LXXXIII.) – Forty-four species are identified and listed, twenty of them are described as new to science. For two species it was necessary to establish two new genera: *Leptoppia* gen. n. (Oppiidae) and *Lemurobates* gen. n. (Tegoribatidae). A new definition of *Passalozetes* is given.

Key-words: Acari – Oribatida – Taxonomy – New species, new genera – Madagascar.

INTRODUCTION

The present contribution[2] is a continuation of my earlier works (MAHUNKA 1993, 1994) concerning the Oribatid fauna of Madagascar. The reasons for, and the goals of, this work were discussed in the above mentioned papers.

This article comprises a list with 44 identified species of which 20 are new to science, two of them requiring the establishment of new genera: *Leptoppia* gen. n. (Oppiidae) and *Lemurobates* gen. n. (Tegoribatidae).

In the descriptions I generally apply the terminology used in several publications by NORTON (e.g. 1982) and BEHAN-PELLETIER (e.g. 1984) based on Grandjean's work. The setation of the parts of the body and the legs is expressed in formulae. The sequence of the anogenital formula is: number of genital, aggenital, anal and adanal setae. Within the setal formula of the palps and the legs, the solenidia of a given segment are marked with the symbol +. The measurements correspond to maximum values in the present material; length is measured from the rostral apex to the farthermost opposite point of the body, width refers to maximum body width (in the case of movable pteromorphae to maximum width without pteromorphae).

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I am extremely grateful to Dr. Malcolm Luxton for critical reading of the manuscript resulting in many corrections and very useful comments.

LIST OF LOCALITIES

Mad-89/1: MADAGASCAR (Prov. Toamasina [anciennement Tamatave], Sous-préf. Moramanga): Réserve spéciale "Analamazoatra" (anciennement Perinet) près d'Andasibe, forêt primaire, prélèvement de sol dans les angles formés par les contreforts d'un grand arbre cassé et mort, 960 m; 21.XI.1989; leg. B. Hauser (B)[3]

Mad-89/2: MADAGASCAR (Prov. Toamasina [anciennement Tamatave], Sous-préf. Moramanga): Réserve spéciale "Analamazoatra" (anciennement Perinet) près d'Andasibe, forêt primaire, prélèvement de sol dans les angles formés par les contreforts de *Oetece* sp. (Lauraceae), 960 m; 21.XI.1989; leg. B. Hauser (B)[3]

Mad-89/7: MADAGASCAR (Prov. Antsiranana [anciennement Diego-Suarez], Sous-préf. Antsiranana): Parc National "Montagne d'Ambre" (= Ambohitra), près de la "Petite Cascade", forêt primaire, prélèvement de sol dans les angles formés par les contreforts d'un grand arbre, 980 m; 23.XI.1989; leg. B. Hauser (B)[3]

Mad-89/8: Madagascar (Prov. Antsiranana [anciennement Diego-Suarez], Sous-préf. Antsiranana): Parc National "Montagne d'Ambre"(= Ambohitra), au début du chemin vers la "Petite Cascade", après la pépinière, forêt primaire, prélèvement de sol dans les angles formés par les contreforts d'un grand arbre vivant et d'un grand arbre mort, 980 m; 23.XI.1989; leg. B. Hauser (B)[3]

Mad-89/15: MADAGASCAR (Prov. Antsiranana [anciennement Diego-Suarez], Sous-préf. Antsiranana): Parc National "Montagne d'Ambre" (= Ambohitra), route vers la "Grande Cascade", forêt primaire, prélèvement de sol dans les angles formés par les contreforts d'un grand arbre, 800 m; 24.XI.1989; leg. B. Hauser (B)[4]

Mad-89/19: MADAGASCAR (Prov. Antsiranana [anciennement Diego-Suarez], Sous-préf. Antsiranana): Parc National "Montagne d'Ambre" (= Ambohitra), route vers le "Petit Lac", forêt primaire, prélèvement de sol dans les angles formés par les contreforts d'un grand arbre mort, 1090 m; 24.XI.1989; leg. B. Hauser (B)[4]

Mad-89/21: MADAGASCAR (Prov. Antananarivo [anciennement Tananarive], Sous-préf. Ambatolampy): Massif de l'Ankaratra, Station Forestière "Manjakatompo", près du sommet de la montagne Anosiarivo, forêt primaire, prélèvement de sol dans une vieille souche, 1980 m; 26.XI.1989; leg. B. Hauser (B)[4]

Mad-89/22: MADAGASCAR (Prov. Antananarivo [anciennement Tananarive], Sous-préf. Ambatolampy): Massif de l'Ankaratra, Station Forestière "Manjakatompo", près du sommet de la montagne Anosiarivo, forêt primaire, prélèvement de sol dans les racines d'un arbre vivant, 1980 m; 26.XI.1989; leg. B. Hauser (B)[4]

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[3] (B) = extraction par appareil Berlese à Antananarivo (Madagascar).

[4] (B)) extraction par appareil Berlese à Genève.

Mad-89/29: MADAGASCAR (Prov. Antsiranana [anciennement Diego-Suarez], Sous-préf. Andoany [anciennement Hell-Ville]): île **Nosy Be**, Réserve naturelle intégrale "Lokobe", forêt primaire près d'Ampasindava, prélèvement de sol dans les angles formés par les contreforts d'un grand arbre, 14 m; 28.XI.1989; leg. B. Hauser (B)[5]

Mad-89/35: MADAGASCAR (Prov. Antsiranana [anciennement Diego-Suarez], Sous-préf. Andoany (anciennement Hell-Ville): île **Nosy Be**, Réserve naturelle intégrale "Lokobe", forêt primaire près Ampasindava, prélèvement de sol dans les angles formés par les contreforts d'un grand arbre, situés en amont du tronc, 85 m; 30.XI.1989; leg. B. Hauser (B)[3]

Mad-89/36: MADAGASCAR (Prov. Antsiranana [anciennement Diego-Suarez], Sous-préf. Andoany (anciennement Hell-Ville): île **Nosy Be**, Réserve naturelle intégrale "Lokobe", forêt primaire près Ampasindava, prélèvement de sol dans les angles formés par les contreforts d'un grand arbre (identique avec Mad-89/35), situés en aval du tronc, 85 m; 30.XI.1989; leg. B. Hauser (B)[4]

Mad-89/43: MADAGASCAR (Prov. Toliara [anciennement Tulear], Sous-préf. Tôlanaro [anciennement Fort-Dauphin]): à 45 km de Tôlanaro sur la route vers Amboasary, forêt de Didiereaceae, prélèvement de sol, env. 60 m; 4.XII.1989; leg. B. Hauser (B)[4]

Mad-89/49: MADAGASCAR (Prov. Toliara [anciennement Tulear], Sous-préf. Tôlanaro [anciennement Fort-Dauphin]): à 53 km de Tôlanaro sur la route vers Amboasary, forêt de Didiereaceae, prélèvement de sol, 75 m; 5.XII.1989; leg. B. Hauser (B)[4]

Mad-89/52: MADAGASCAR (Prov. Tamatave, Sous-préf. Ambodifototra): île **Nosy Boraha** (anciennement Ile Sainte-Marie), région de "La Crique", forêt de "Kalalao" au sud-est de Lonkintsy, forêt primaire, prélèvement de sol dans les angles formés par les contreforts d'un grand arbre, 80 m; 7.XII.1989; leg. B. Hauser (B)[4]

Mad-89/54: MADAGASCAR (Prov. Tamatave, Sous-préf. Ambodifototra): île **Nosy Boraha** (anciennement Ile Sainte-Marie), région de "La Crique", forêt de "Kalalao" au sud-est de Lonkintsy, forêt primaire, prélèvement de sol dans les angles formés par les contreforts d'un grand arbre, 105 m; 7.XII.1989; leg.B. Hauser (B)[4]

LIST OF IDENTIFIED SPECIES

Ctenacaridae Grandjean, 1954

Beklemishevia cf. *demeteri* Mahunka, 1984
Locality: Mad-89/49: 2 specimens.
Distribution: Ethiopia, Tanzania.

Aphelacaridae Grandjean, 1954

Aphelacarus acarinus (Berlese, 1910)
Locality: Mad-89/49: 5 specimens.
Distribution: Widely distributed species, especially holarctic.

Phthiracaridae Perty, 1841

Phthiracarus insularis Balogh, 1962
Locality: Mad-89/52: 8 specimens.
Distribution: Madagascar (known from the type locality only).

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[5] (B) = extraction par appareil Berlese en partie à Antananarivo et en partie à Genvève.

Hypochthoniidae Berlese, 1910

Malacoangelia remigera Berlese, 1913
Locality: Mad-89/29: 8 specimens.
Distribution: A common circumtropical species.

Sphaerochthoniidae Grandjean, 1947

Sphaerochthonius variesetosus sp. n.
Locality: Mad-89/36.

Lohmanniidae Berlese, 1926

Javacarus porosus Hammer, 1960
Locality: Mad-89/29: 3 specimens.
Distribution: See Mahunka 1993: 291.

Meristacarus madagascarensis Balogh, 1962
Locality: Mad-89/29: 22 specimens.
Distribution: Madagascar (known from the type locality only).

Paulianacarus rugosus Balogh, 1960
Localities: Mad-89/1: 5 speciemens; Mad-89/52: 1 specimen.
Distribution: Madagascar (known from the type locality only).

Nanhermanniidae Sellnick, 1928

Nanhermannia milloti Balogh, 1960
Locality: Mad-89/22: 6 specimens.
Distribution: Madagascar (known from the type locality only).

Plateremaeidae Trägårdh, 1931

Nooliodes glaber (Balogh, 1962)
Locality: Mad-89/29: 2.
Distribution: Madagascar (known from the type locality only).

Microzetidae Grandjean, 1936

Acaroceras (Malgoceras) helleri Mahunka, 1993
Localities: Mad-89/29: 11 specimens; Mad-89/36: 2 specimens.
Distribution: Madagascar.

Berlesezetes cf. *auxiliaris* (Grandjean, 1936)
Localites: Mad-89/8: 5 specimens; Mad-89/15: 2 specimens; Mad-89/29: 2 specimens; Mad-89/36: 5 specimens.
Distribution: Widely distributed circumtropical (?) species.

Comorozetes corrugatus sp.n.
Localities: Mad-89/35; Mad-89/36, Mad-89/52.

Hymenozetes verticillatus sp.n.
Localities: Mad-89/52; Mad-89/54.

Megazetes nosybe Mahunka, 1993
Locality: Mad-89/29: 5 specimens.
Distribution: Madagascar.

Rhopalozetes madecassus Mahunka, 1993
Locality: Mad-89/29: 4 specimens.
Distribution: Madagascar.

Vermacarus armatus sp. n.
Locality: Mad-89/21.

Eremobelbidae Balogh, 1961
Eremobelba cellulosa sp. n.
Locality: Mad-89/35.

Eremulidae Grandjean, 1956
Caveremulus cordisetus Mahunka, 1983
Localities: Mad-89/29: 5 specimens; Mad-89/35: 2 specimens.
Distribution: See Mahunka 1993: 291.

Carabodidae C.L. Koch, 1837
Congocepheus involutus sp.n.
Localities: Mad-89/52; Mad-89/54.

Peloppiidae Balogh, 1943
Trichoppia longiseta Balogh, 1960
Locality: Mad-89/22: 13 specimens.
Distribution: See Mahunka 1993: 291.

Otocepheidae Balogh, 1961
Didierotocepheus berndi Mahunka, 1993
Localities: Mad-89/22: 15 specimens; Mad-89/43: 3 specimens; Mad-89/49: 2 specimens.
Distribution: Madagascar.

Pseudotocepheus lienhardi Mahunka, 1993
Localities: Mad-89/1: 8 specimens; Mad-89/2: 2 specimens; Mad-89/43: 5 specimens.
Distribution: Madagascar.

Pseudotocepheus pygmaeus Balogh, 1962
Locality: Mad-89/36: 2 specimens.
Distribution: Madagascar (known from the type locality only).

Pseudotocepheus tolanaro sp.n.
Locality: Mad-89/43.

Oppiidae Grandjean, 1951
Brachioppiella boraha Mahunka, 1993
Locality: Mad-89/52: 3 specimens.
Distribution: Madagascar.

Elaphroppia quadripilosa (Balogh, 1960)
Locality: Mad-89/52: 2 specimens.
Distribution: Madagascar (known from the type locality only).

Goyoppia sexpilosa (Balogh, 1960)
Locality: Mad-89/7: 2 specimens.
Distribution: Madagascar (known from the type locality only).

Lanceoppia (Bicristoppia) kalalao sp. n.
Locality: Mad-89/54.

Lasiobelba lemuria sp.n.
Locality: Mad-89/29.

Leptoppia procera gen. n., sp. n.
Locality: Mad-89/15, Mad-89/19.

Oppiella nova (Oudemans, 1902)
Locality: Mad-89/19: 5 specimens.
Distribution: Cosmopolitan species.

Oxyoppia pustulata sp.n.
Locality: Mad-89/52.

Sphagnoppia alata sp.n.
Locality: Mad-89/52.

Striatoppia luisiae Mahunka, 1993
Locality: Mad-89/52: 2 specimens.
Distribution: Madagascar.

Trematoppia cristipes Balogh, 1962
Localities: Mad-89/15: 1 specimen; Mad-89/29: 8 specimens.
Distribution: Madagascar (known from the type locality only).

Rhynchoribatidae Balogh, 1961
Rhynchoribates genavensium sp.n.
Localites: Mad-89/15, Mad-89/29.

Passalozetidae Grandjean, 1954
Passalozetes (*Passalozetes*) *lienhardi* sp.n.
Localities: Mad-89/43; Mad-89/49.

Passalozetes (*Bipassalozetes*) *hauseri* sp. n.
Locality: Mad-89/43.

Oribatellidae Jacot, 1925
Oribatella madagascarensis sp. n.
Locality: Mad-89/35.

Tegoribatidae Grandjean, 1954
Lemurobates antsiranana gen. n., sp. n.
Localities: Mad-89/7; Mad-89/19; Mad-89/35.

Galumnidae Jacot, 1925
Galumna ankaratra sp.n.
Locality: Mad-89/22.

Galumna engelbrechti sp. n.
Locality: Mad-89/35.

Galumna tuberculata sp.n.
Locality: Mad-89/29.

DESCRIPTIONS AND DISCUSSIONS

Beklemishevia cf. **demeteri** Mahunka, 1984

The material contains two specimens. Unfortunately both are so badly damaged that it was impossible to study all the important features (e.g. ratio of sensillus and the interlamellar setae; setae c_1 and c_2). However, I could ascertain that the tarsus of leg I has a tiny empodium and certain that seta p_1 is pilose. Consequently the species belongs to the genus *Beklemishevia* Zachvatkin, 1945, species of which are rare in this region. I consider the specimens to be identical with *B. demeteri* Mahunka, 1984 described from Ethiopia and Tanzania (MAHUNKA 1984).

Malacoangelia remigera Berlese, 1913 (Fig. 4)

For a long time the genus *Malacoangelia* Berlese, 1913 was monotypic. Recently, WALLWORK (1960), CHAKRABARTY et al. (1972) and SARKAR & SUBÍAS (1982) described several varieties and new species. Comparing the present material with specimens from Sarawak (Serapi, Sar-87/64, leg. B. Hauser) and with the redescription of GRANDJEAN (Central American specimens) (GRANDJEAN 1935) I found that they differ slightly (setae c_1 [Fig. 4] heart-shaped, relatively short) but these differences are not enough to describe a new taxon. The present specimens have bifurcate rostral setae and the sensillus is unilaterally ciliate (pectinate) (these cilia blunt at tip, setae c_2 bifurcate).

Sphaerochthonius variesetosus sp. n. (Figs 1-3)

Material examined: Holotype: Mad-89/36, 37 paratypes from the same sample. Holotype and 25 paratypes: MHNG[6] and 12 paratypes (1467-PO-93): HNHM[7].

Measurements. - Length of body: 228-272 µm, width of body: 201-227 µm.

Integument: Body, legs and setae covered by thick cerotegument layer. Regular polygonate pattern observable only on the anterior part of notogaster, other parts of the body covered by irregular and mostly granulate cerotegument. All setae, also the sensillus, covered by an irregular but thick layer.

Prodorsum: Sensillus wide, directed posteriorly. Its surface with papillae ordered in rows, like a brush. Rostral, lamellar and interlamellar setae "T-shaped", both pairs of exobothridial setae normal, phylliform, setae *exp* much shorter and smaller than the other ones.

Notogaster: Notogastral setae (Fig. 1) belonging to three types , most of them "T-shaped" (Fig. 2), but setae d_1 and d_2 minute, e_1 and e_2 simple phylliform (setiform with secretion layer).

Ventral regions: Genital plates with a prominent longitudinal crest behind the setae laterally. Their posterior, narrowed part bearing a characteristic, lamelliform expansion constructed from cerotegument (Fig. 3). They cover the anterior part of the anal and adanal plates. Eight pairs of genital setae present, all long, simple. More than ten pairs (10-13 pairs) of anal and five pairs of adanal setae present. The anal setae setiform, the adanal ones "T-shaped".

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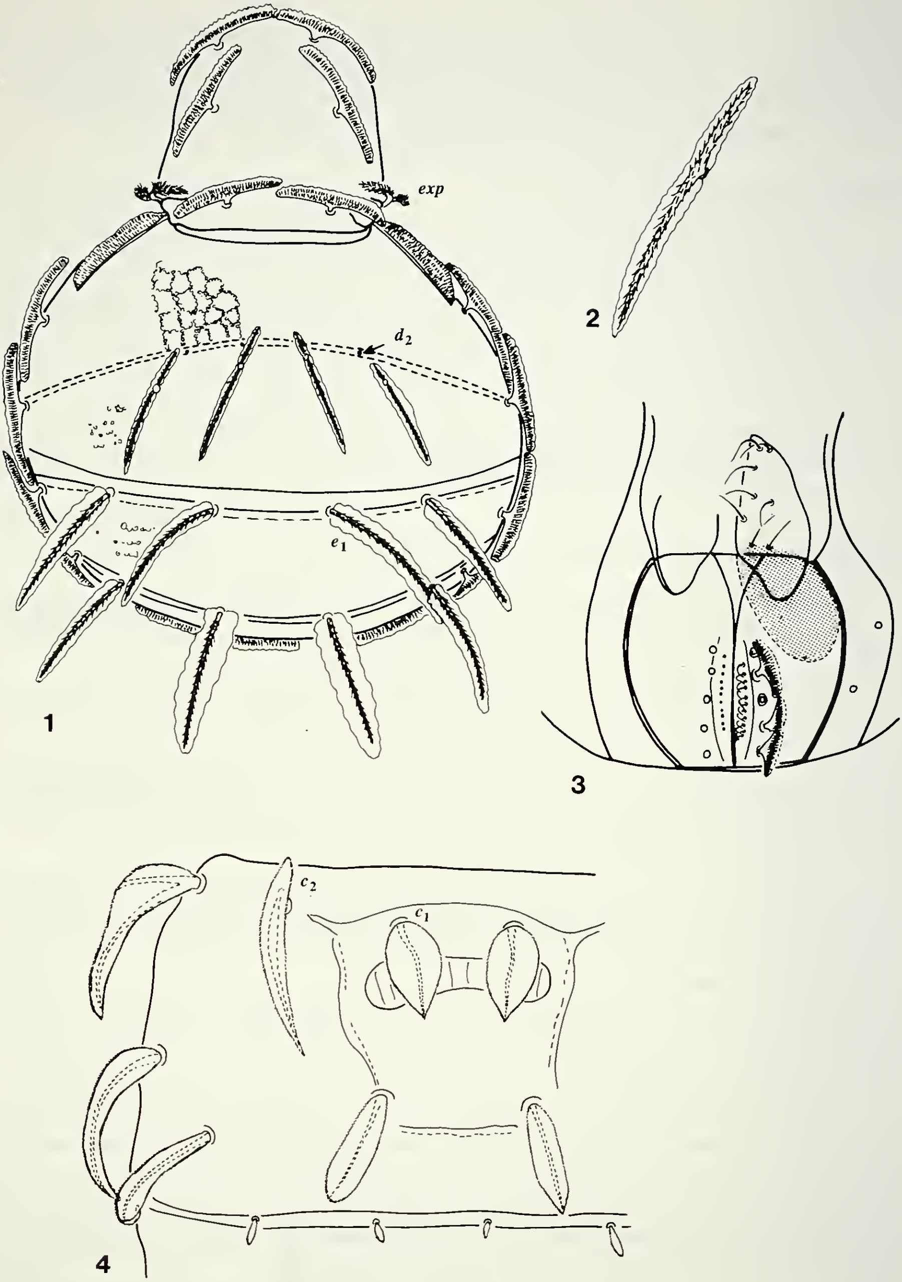
[6] MHNG = deposited in the Muséum d'Histoire naturelle, Genève.

[7] HNHM = deposited in the Hungarian Natural History Museum, Budapest, with identification number of the specimens in the Collection of Arachnida.



FIGS 1-4

Sphaerochthonius variesetosus sp. n. – 1: dorsal aspect, 2: seta *cp*, 3: anogenital region. *Malacoangelia remigera* Berlese, 1913 – 4: anterior part of notogaster.

Legs: All legs tridactylous, heterodactylous. Solenidium ω_1 of tarsus I strongly arched backwards to the surface of leg, like a snake.

Remarks: The new species is well characterised by the simple, phylliform notogastral setae and the large number of anal setae. This combination of characters is unique in the family. A very large number of anal setae is known only in *S. transversus* Wallwork, 1960 from Ghana. However its notogastral setae are uniformly "T-shaped" and the notogastral setae are phylliform.

Derivatio nominis: After the form of the varying "T-shaped" and phylliform setae.

Comorozetes corrugatus sp. n. (Figs 5-10)

Material examined: Holotype: Mad-89/52, 6 paratypes from the same sample; 13 paratypes: Mad-89/35; 2 paratypes: Mad-89/36. Holotype and 13 paratypes: MHNG, 8 paratypes (1468-PO-93): HNHM.

Measurements. - Length of body (without lamellae): 397-446 µm, width of body: 359-370 µm.

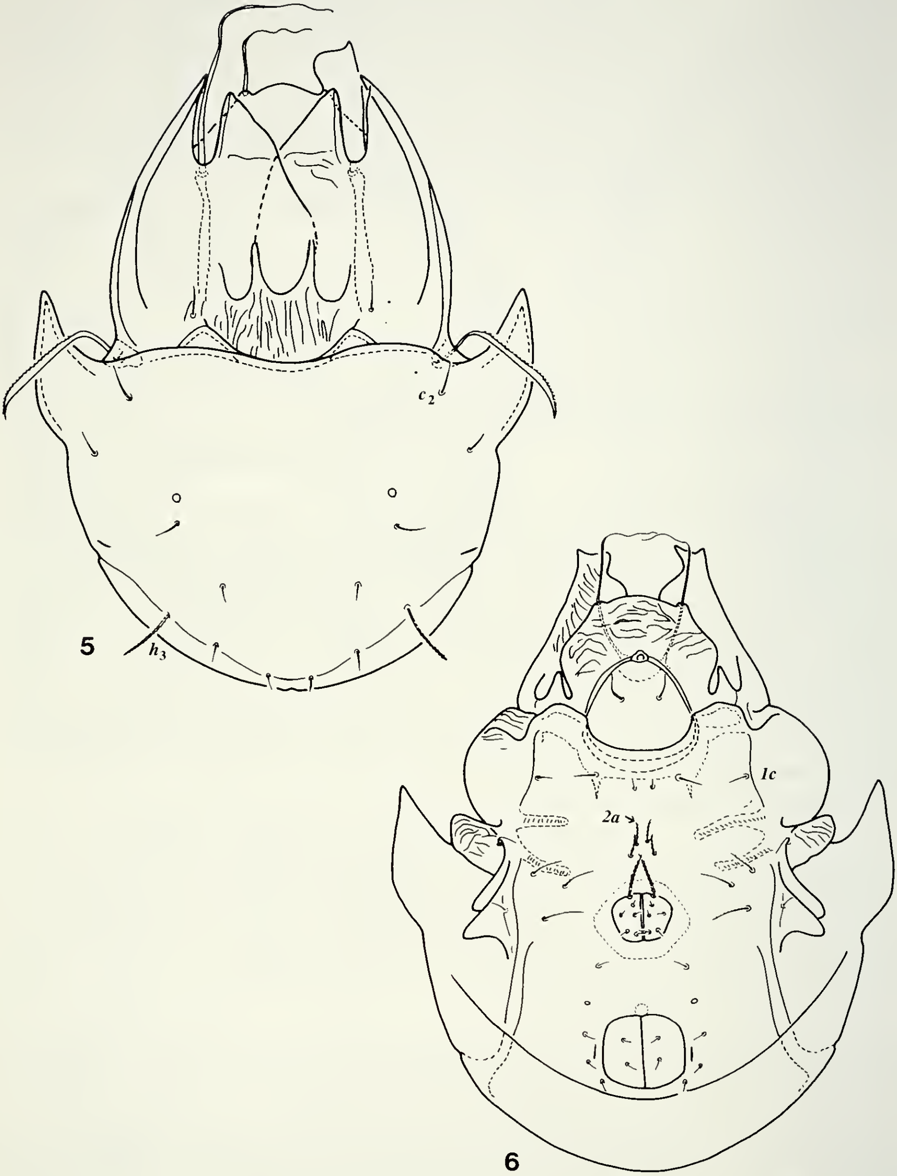
Prodorsum: Rostrum without apex, broadly rounded, with two tubercles laterally from which arise the flagellate rostral setae. Lamellae very wide, their median parts overlapping, each obscurely connected with two processes in the interlamellar region (Fig. 5). In this region some longitudinal wrinkles also observable basally. Lamellar cusps with a deep incision medially, outer apex sharply pointed, inner one blunt. Interlamellar setae short, simple, arising medially on the lamellar surface. Sensillus thick, setiform, directed outwards and backwards, its outer surface barbed, barbs ordered in one row. Tutorium very large, dilated distally, reaching out from the lamellae. Its surface distinctly rugose, with transversal ridges anteriorly and longitudinal ones medially and basally.

Notogaster: Surface of notogaster smooth, but two hollows laterally connected by a shallow furrow (Fig. 5). Dorsosejugal suture complete, slightly concave medially. Pteromorphae simple, with a sharply pointed, small cusp laterally. It is characteristically framed (Fig. 10), its margins parallel. Nine pairs of notogastral setae of different lengths, h_3 the longest of all and finely roughened, all others simple, smooth, c_2 slightly longer than the rest.

Lateral region of the podosoma: Pedotecta 1 and 2-3 very large, both well striated. Discidium also large but without any sculpture. Above the acetabula of legs II-IV a large granulate area present (Fig. 7).

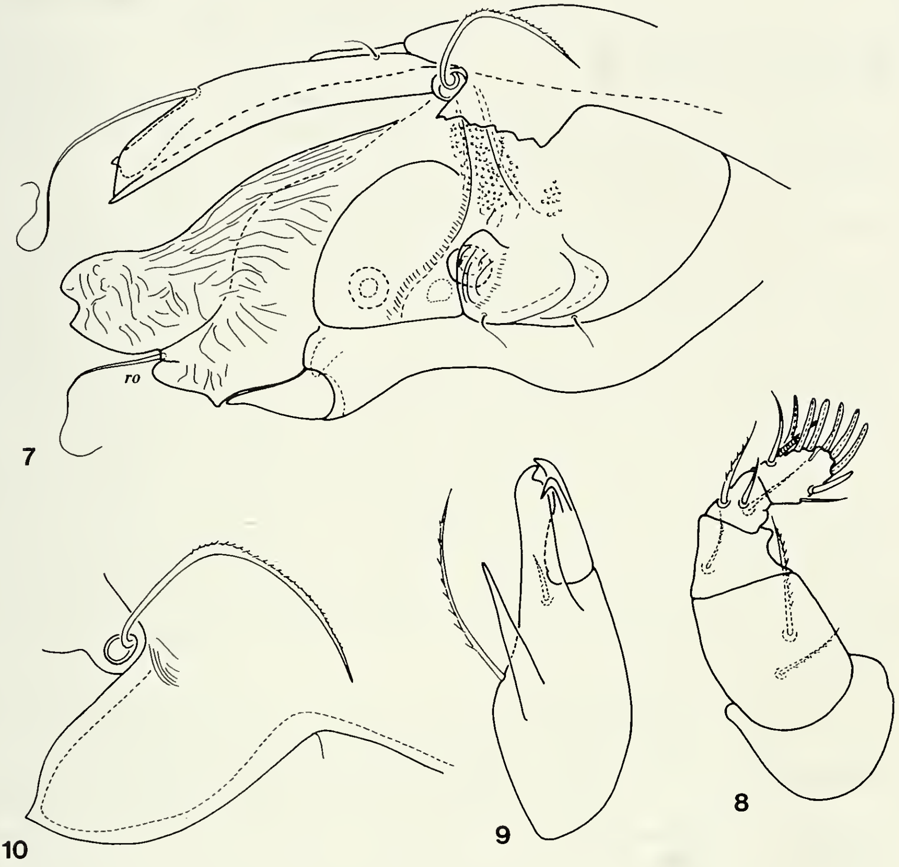
Gnathosoma: Digitus fixus of chelicera (Fig. 9) with one tooth, digitus mobilis smooth, but a falciform structure visible on it. Tegula normal. Seta *cha* setiform, long; seta *chb* short, spiniform. Setal formula of palp: 2 - 1 - 3 - 9+1 (Fig. 8), only two setae among them setiform, all others digitiform, appearing to be eupathidia.

Ventral regions: Coxisternal surface smooth, epimeral borders and apodemes weakly developed (Fig. 6). Among the epimeral setae *1a*, *1c* simple, all others finely ciliate and longer than the preceding ones. Setae *2a* and *3a* arising very near to each other. Anterior pair of genital setae long and distinctly barbed, all other



FIGS 5-6

Comorozetes corrugatus sp. n. – 5: dorsal aspect, 6: ventral aspect.



FIGS 7-10

Comorozetes corrugatus sp. n. – 7: podosoma in lateral aspect, 8: palp, 9:chelicera, 10: pteromorpha in lateral aspect.

setae in the anogenital region minute. Anogenital setal formula: 6 - 1 - 2 - 3. A characteristic, deep, but small foveola, like a foramen present between the anal and genital apertures.

Remarks: On the basis of some characters (habitus, form of lamellae, form of tutorium, shape of sensillus, one pair of foramina in the anogenital region, etc.) the new species is well assignable to the recently described genus *Comorozetes* Mahunka, 1994. However it differs from the type species of this genus by the 2 pairs of anal setae (four pairs in the type-species of *Comorozetes*). This feature is not considered to be of generic significance.

Derivatio nominis: After the sculpture of the interlamellar surface.

Hymenozetes verticillatus sp. n. (Figs 11-13)

Material examined: Holotype: Mad-89/52, 2 paratypes from the same sample; 3 paratypes: Mad-89/54. Holotype and 3 paratypes: MHNG and 2 paratypes (1469-PO-93): HNHM.

Measurements. - Length of body: 304-327 µm, width of body (without lamellae and pteromorphae): 239-272 µm.

Prodorsum: Rostral apex observable only in lateral aspect, beak-shaped. In dorsal aspect a broad straight margin visible and two long tubercles, on which the rostral setae arise, located very far from each other. Lamellae very wide, the two parts overlapping, with a sharply pointed outer and a flattened median apex. Lamellae connected basally by a thick, concave band, interlamellar setae arising on its underside. Rostral, lamellar and interlamellar setae long, with a curiously flagellate distal part. Sensillus directed outwards, its distal end slightly dilated, unilaterally ciliate.

Notogaster: Dorsosejugal suture nearly straight medially, with deep hollows before the pteromorphae. Pteromorpha long, linguliform, with 1 or 2 small teeth distally. Nine pairs of notogastral setae present; in the middle of notogaster is a conspicous protuberance surrounded by five pairs of notogastral setae (Fig. 11). These setae bear long, spiniform "cilia", like a christmas-tree. The two pairs of setae in humeral position (c_2, *la*) much smaller than the others - excepting setae in posteromarginal position (*p*).

Lateral region of podosoma: Tutorium very large (Fig. 13), with a rounded apex. Its surface ornamented by some wrinkles (anteriorly) and (in a small basal region) by polygonal design. Pedotecta 1 and the discidium very large.

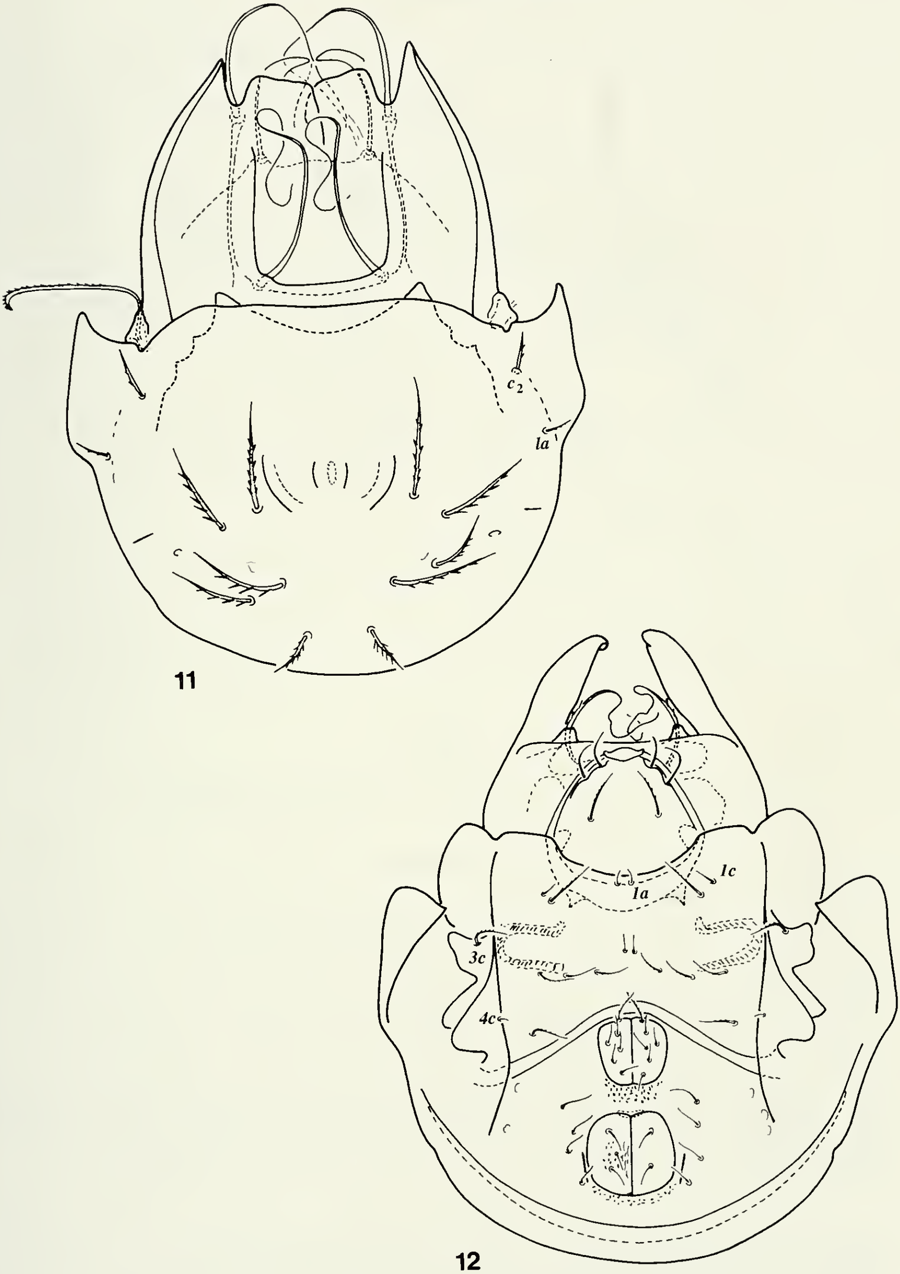
Ventral regions: Coxisternal region lacking characteristic sculpture. Apodemes and epimeral borders – excepting a broad band in front of the genital aperture – weakly developed (Fig. 12). Among the epimeral setae *1a* arise very near to each other, setae *1b* also very near to *1c*. Setae *3c* conspicuously strong, setae *4c* the shortest of all epimeral setae. Surface of the genital plates smooth, anal plates with minute, irregular foveolae, the same structure observable between the genital and anal aperture and behind the latter. The anterior pair of genital setae longer and stronger than the others and conspicuously ciliate. All three pairs of adanal setae arising in paraanal position, all directed inwards.

Remarks: Both heretofore known Hymenozetes Balogh, 1962 species were described from Madagascar. This new species without doubt belongs to this genus. On the basis of the form of the notogastral setae (fine and short in *H. mirabilis* Balogh, 1962, longer and stronger, but not spiniform, in *H. quadricornutus* Mahunka, 1993) these three species are readily distinguished from each other.

Derivatio nominis: After the arrangement of the notogastral setae.

Vermacarus armatus sp. n. (Figs 14-16)

Material examined: Holotype: Mad-89/21, 7 paratypes from the same sample. Holotype and 4 paratypes: MHNG and 3 paratypes (1470-PO-93): HNHM.



Figs 11-12

Hymenozetes verticillatus sp. n. – 11: dorsal aspect, 12: ventral aspect.

Fig. 13

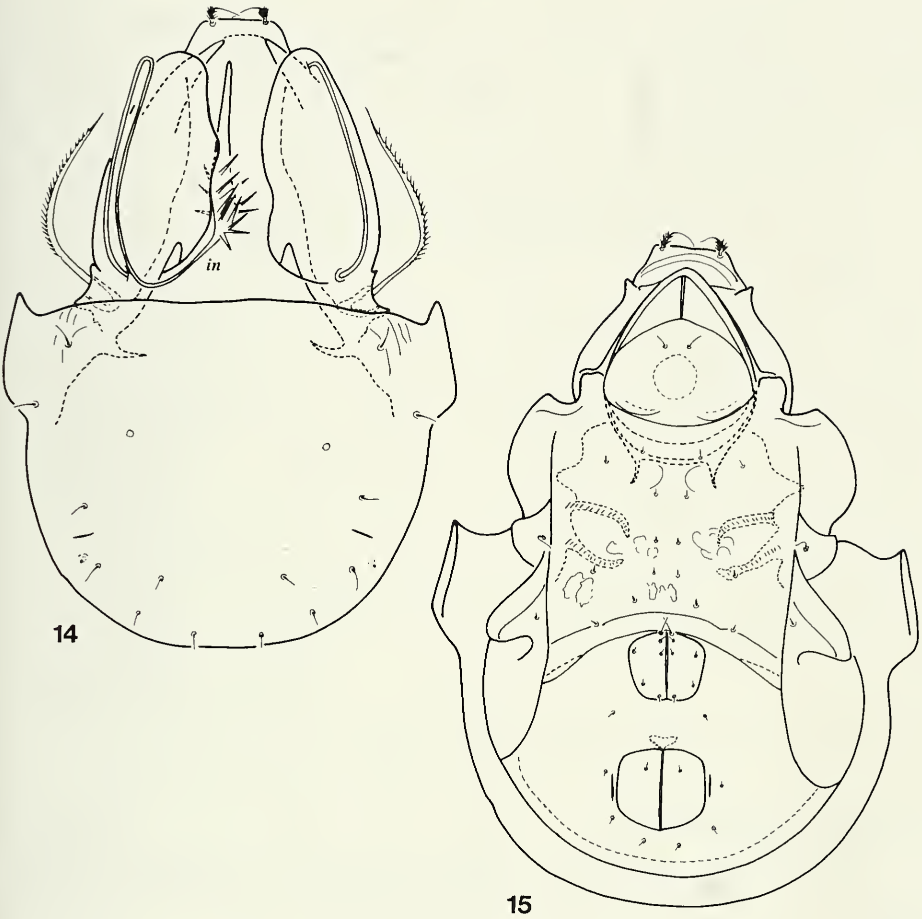
Hymenozetes verticillatus sp. n. – 13: podosoma in lateral aspect.

Measurements. - Length of body: 255-262 µm, width of body: 174-185 µm.

Prodorsum: Rostrum wide, its beak-shaped apex visible only in lateral view (Fig. 16), its dorsal aspect straight anteriorly. Rostral setae arising marginally, ciliate basally and smooth distally. Lamellae wide, without lamellar apices, rounded anteriorly (Fig. 14). I was unable to find the lamellar setae. Interlamellar setae (*in*) inserted on the lamellar surface, very long, bent completely backwards and then forwards, with a characteristically widened very large, spinose and fusiform distal end. Sensillus directed forwards, well spinose, mostly on its outer margin. Tutorium with two apices, surface between them concave. It projects only slightly from the prodorsal surface.

Notogaster: The notogaster very wide, its posterior margin seems to be straight in dorsal aspect (Fig. 14). Dorsosejugal suture complete. A large hollow observable in the humeral region, this part pustulate (Fig. 16). Pteromorpha comparatively small, with a sharply pointed anterolateral apex. All nine pairs of notogastral setae short and simple.

Ventral regions: Among the apodemes only $ap._2$ and the sejugal apodeme observable (Fig. 15). A wide transversal band running in front of the genital



Figs 14-15

Vermacarus armatus sp. n. – 14: dorsal aspect, 15: ventral aspect.

aperture. All epimeral setae minute. Excepting the anterior genital setae, all setae in the anogenital region also minute. Anogenital setal formula: 3 - 1 - 2 - 3.

Legs: Femur II, trochanters and femora of legs III and IV, and tibiae have a blade- like formation basally. The latter bearing two dilated, ciliate, strong setae (*v*' and *v*").

Remarks: On the basis of the habitus, the short notogastral setae, the direction of the sensillus and, primarily, the curiously modified interlamellar setae the new species resembles the genus *Vermacarus* Balogh & Mahunka, 1980 described from Cuba.

Derivatio nominis: After the form of the mace-like interlamellar setae.

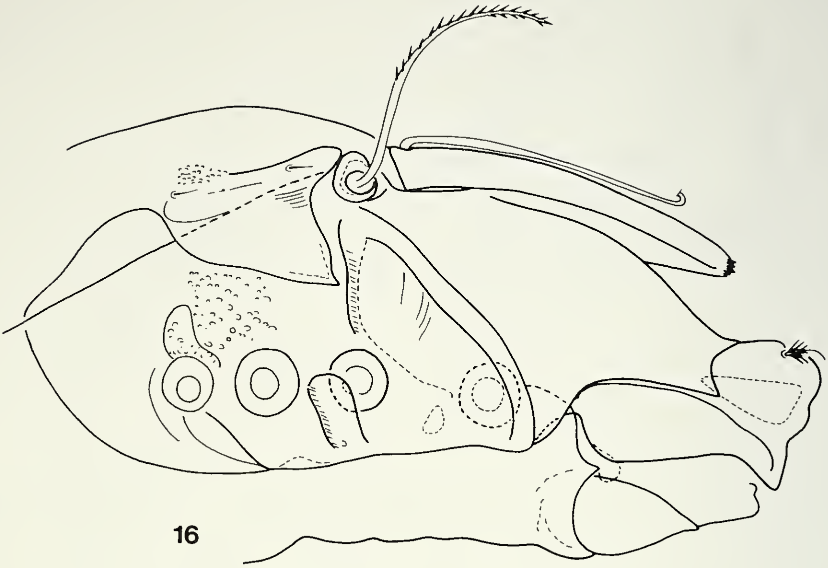


FIG. 16

Vermacarus armatus sp. n. – 16: podosoma in lateral aspect.

Eremobelba cellulosa sp. n. (Figs 17-21)

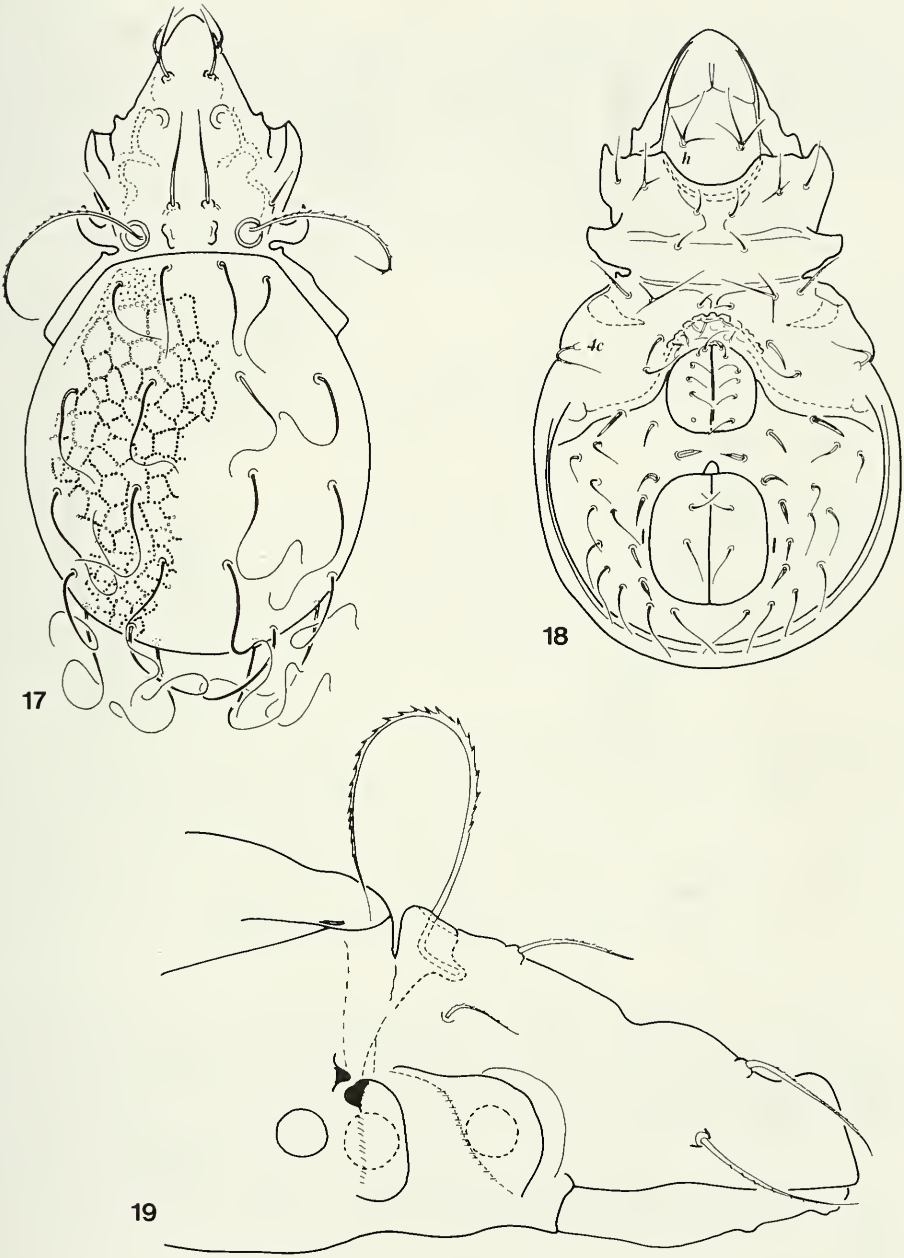
Material examined: Holotype: Mad-89/35, 32 paratypes from the same sample. Holotypes and 20 paratypes: MHNG and 12 paratypes (1471-PO-93): HNHM.

Measurements.- Length of body: 386-463 μm, width of body: 223-267 μm.

Prodorsum: Rostrum conical. Prodorsal surface with some tubercles and crests (Fig. 17), rostral, lamellar and interlamellar setae also arising on such tubercles. Rostral setae located laterally, these and the lamellar setae slightly dilated, but both pairs shorter than the setiform interlamellar setae. Sensillus typical for the genus, arched, with many large spicules on its outer margin. Exobothridial setae simple.

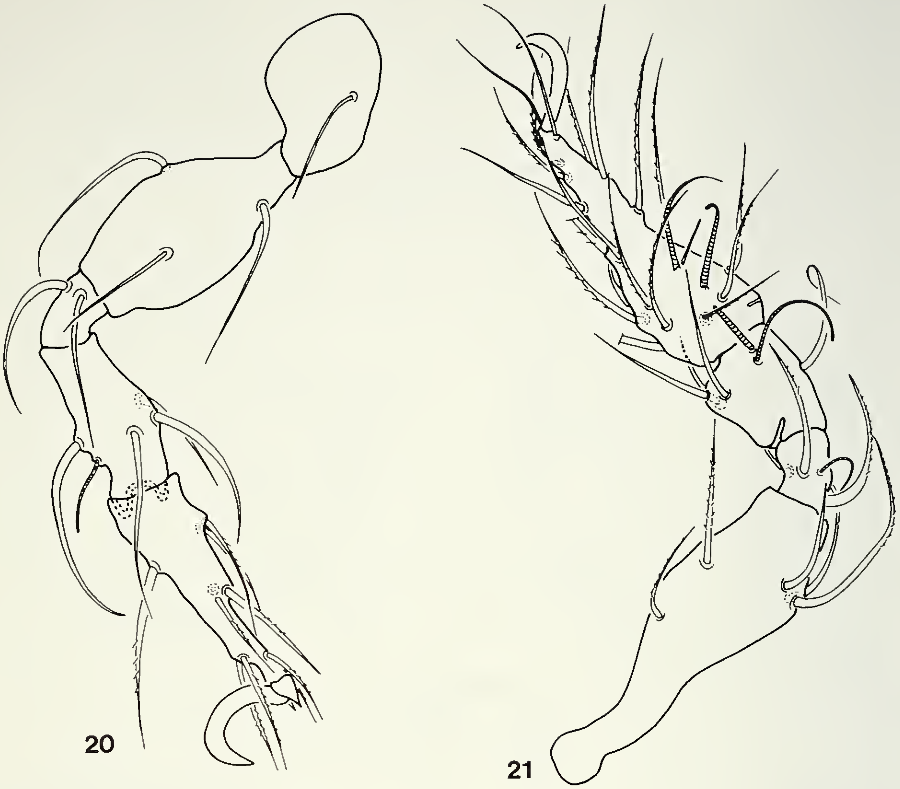
Notogaster: Notogastral surface covered by a characteristic, granulate cerotegument. The granules placed irregularly in a narrow anterior transversal band of the notogaster, behind them the whole surface ornamented by the granules forming a polygonate pattern whose cells are comparatively small. All eleven pairs of notogastral setae setiform, with a long, flagellate, filiform distal part (Fig. 17).

Lateral region of podosoma: A pair of sharp tubercles opposing the lateral tubercles of pedotecta 2-3 (Fig. 19). Pedotecta 1 and 2-3 large.



FIGS 17-19

Eremobelba cellulosa sp. n. – 17: dorsal aspect, 18: ventral aspect, 19: podosoma in lateral aspect.



FIGS 20-21

Eremobelba cellulosa sp. n. – 20: leg IV, 21: leg I.

Coxisternal region: Epimeral setal formula: 3 - 1 - 3 - 3. Among the setae *1b*, *3b*, and the *h* seta on mentum, branched basally, star-shaped, *4a* sword-shaped. Seta *4c* arising on a tubercle. In front of the genital aperture, on the epimeral surface a large area present with irregular crests, laths and spots medially (Fig. 18).

Anogenital region: Normal (in this genus characteristic neotrichy present). Among the setae, 7 pairs in aggenital and adanal position slightly broadened or sword-shaped. The other simple, setiform. Genital setae ordered in one longitudinal arch.

Legs: Their form and chaetotaxy are typical for the genus. Leg setal formulae are:

I: 1 - 5 - 3+1 - 4+2 - 20+2 - 1 (Fig. 21)
IV: 1 - 3 - 2 - 4+1 - 12 - 1 (Fig. 20).

Remarks: The new species is well characterised by the comparatively small size of the cells forming the polygonate sculpture composed of granules and by the flagellate notogastral setae. The other *Eremobelba* Berlese, 1908 species having polygonate sculpture have polygons of different size, firstly medially, or these polygons are much larger. On this basis the new species is readily distinguished from all congeners.

Derivatio nominis: After the sculpture of the notogaster.

Congocepheus involutus sp.n. (Figs 22-24)

Material examined: Holotype: Mad-89/52; paratype: Mad-89/54. Holotype: MHNG and paratype (1472-PO-93): HNHM.

Measurements. - Length of body: 299-310 μm, width of body: 206-213 μm.

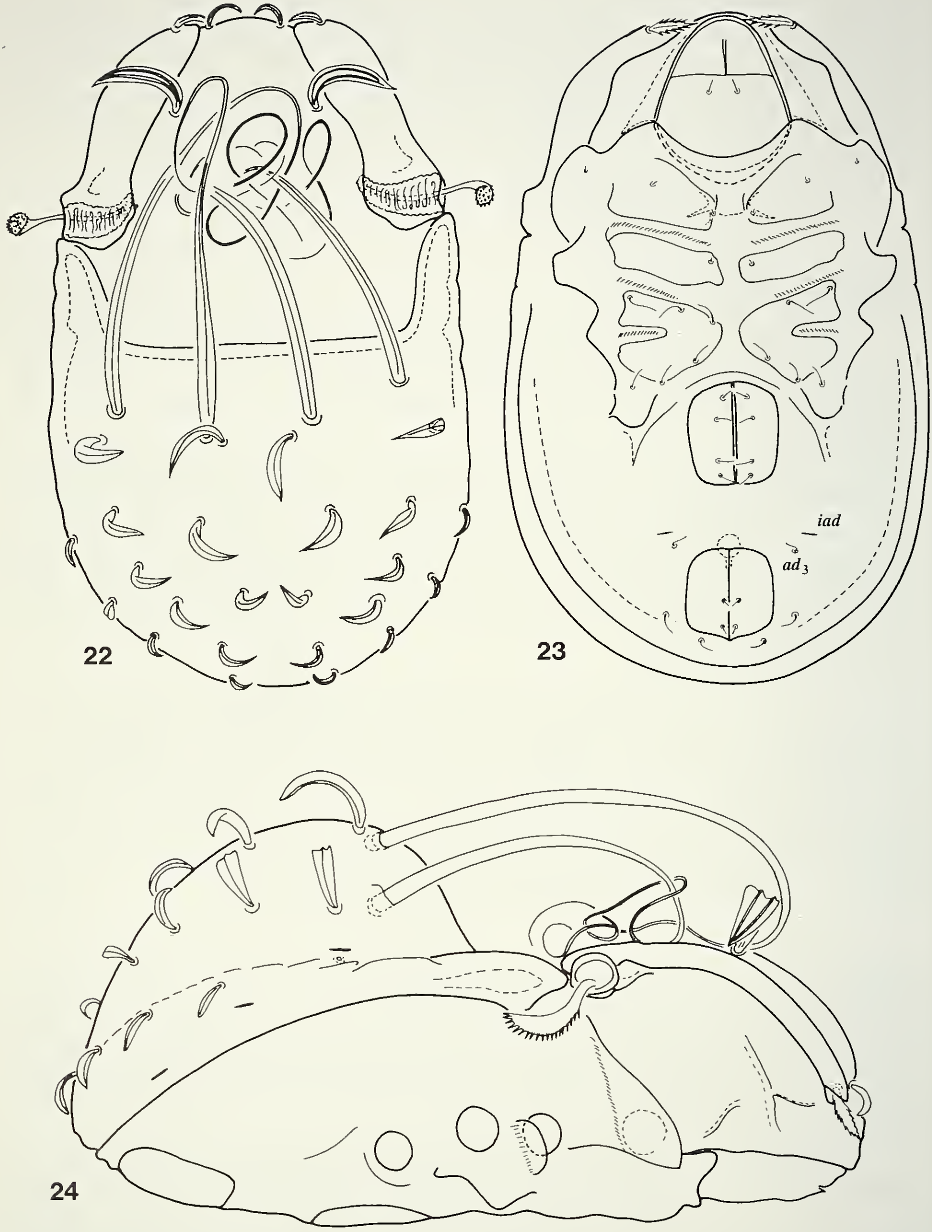
Prodorsum: Rostrum wide, rounded. Rostral and lamellar setae phylliform, the first with serrated margins. Interlamellar setae arising on the interlamellar surface, large phylliform, directed outwards. Bothridium conspicuously long, arched forwards. Sensillus comparatively short, dilated, with rounded and spiculate distal end, nearly spoon-shaped (Fig. 22) in dorsal aspect. Basal part of the interlamellar region excavated, this region extends over the anterior part of the notogaster, thus, a very large hollow is formed.

Notogaster: In spite of the sejugal hollow the humeral part seems to be a pair of long processes. Fourteen pairs of notogastral setae present, two pairs of them very long, curved, coiled up to fill the sejugal and prodorsal hollows (Fig.24). Two setae of the paratype are not coiled up, but bent over the rostrum lying on the ventral part and reaching to the genital opening. The rest of the notogastral setae short, phylliform and - excepting the four pairs in posteromarginal position which are shorter - no essential difference between them. Lyrifissures visible only in lateral view.

Ventral regions: Coxisternal region with robustly sclerotised structure, epimeral borders very wide. All epimeral setae clearly visible, all fine, setiform or minute. Epimeral setal formula: 3 - 1 - 3 - 3. Genital plates comparatively large, slightly larger than the anal ones (Fig. 23). Four (in the paratype 4-5) pairs of genital, 2 pairs of anal, and three pairs of adanal setae present. Aggenital setae absent. Lyrifissure *iad* conspicuous, located in front of the anal aperture, in apoanal position. Setae ad_3 in preanal position.

Remarks: On the basis of the excavated prodorsum and notogaster and the two pairs of notogastral setae directed anteriorly the new species is readily associated with the genus *Congocepheus* Balogh, 1958. It is easily distinguishable from all known *Congocepheus* species by the unique length and shape of these notogastral setae.

Derivatio nominis: After the inward coiled (= involuted) anterior notogastral setae.



FIGS 22-24

Congocepheus involutus sp. n. – 22: dorsal aspect, 23: ventral aspect, 24: lateral aspect.

Pseudotocepheus tolanaro sp. n. (Figs 25-27)

Material examined: Holotype: Mad-89/43, 2 paratypes from the same sample. Holotype and 1 paratype: MHNG and 1 paratype (1473-PO-93): HNHM.

Measurements: Length of body: 736 µm (male), 931-1015 µm (females), width of body: 292 µm (male), 444-515 µm (female).

Prodorsum: Rostrum rounded. Form of lamellae typical for the genus: comparatively short and narrow, slightly bent inwards to the basis of the lamellar setae. Lamellar apex absent. Tutorium short, straight. Three weak median prodorsal condyles present (one pair and an unpaired medial one), lateral condyles also weak. In the interbothridial region a series of paired striated alveoli. Surface foveolate along the lamellae and pustulate in the exobothridial region, generally finely punctate. Among the prodorsal setae one pair (*ro*) setiform, three pairs needle-shaped. Interlamellar setae the longest of all, lamellar setae shorter than rostral ones (Fig. 27). Exobothridial setae the shortest, but not thinner than the others. Sensillus directed laterally, with rounded head.

Notogaster: No condyles on the anterior margin of the notogaster, but the shoulder slightly protruding anteriorly. Surface finely punctate, some weak foveolae also present laterally. Ten pairs erect, needle-shaped, finely and sparsely ciliate notogastral setae present, the anterior setae (c_2, *la*, *lm*) shorter than the posterior ones, but the difference not greater than one-third (Fig. 25).

Ventral regions: Apodemes well developed. All epimeral setae simple, setae *1b* and *3b* characteristically longer than *1c* or *3c*. Setae *1c* arising conspicuously nearer to the acetabulum of leg II, than to leg I. Anogenital setal formula: 3 - 1 - 3 - 3. Genital, aggenital and anal setae setiform, adanal ones needle-shaped. Lyrifissures *iad* in preanal and apoanal position (Fig. 26).

Legs: Type of the ultimate setae: L - L - L - L. Tarsus of leg II-IV with dorsal teeth.

Remarks: There is no doubt that the new species belongs to the genus *Pseudotocepheus* Balogh, 1960. It differs from the other species by the position of seta *1c* and by the uniformly needle-shaped notogastral setae.

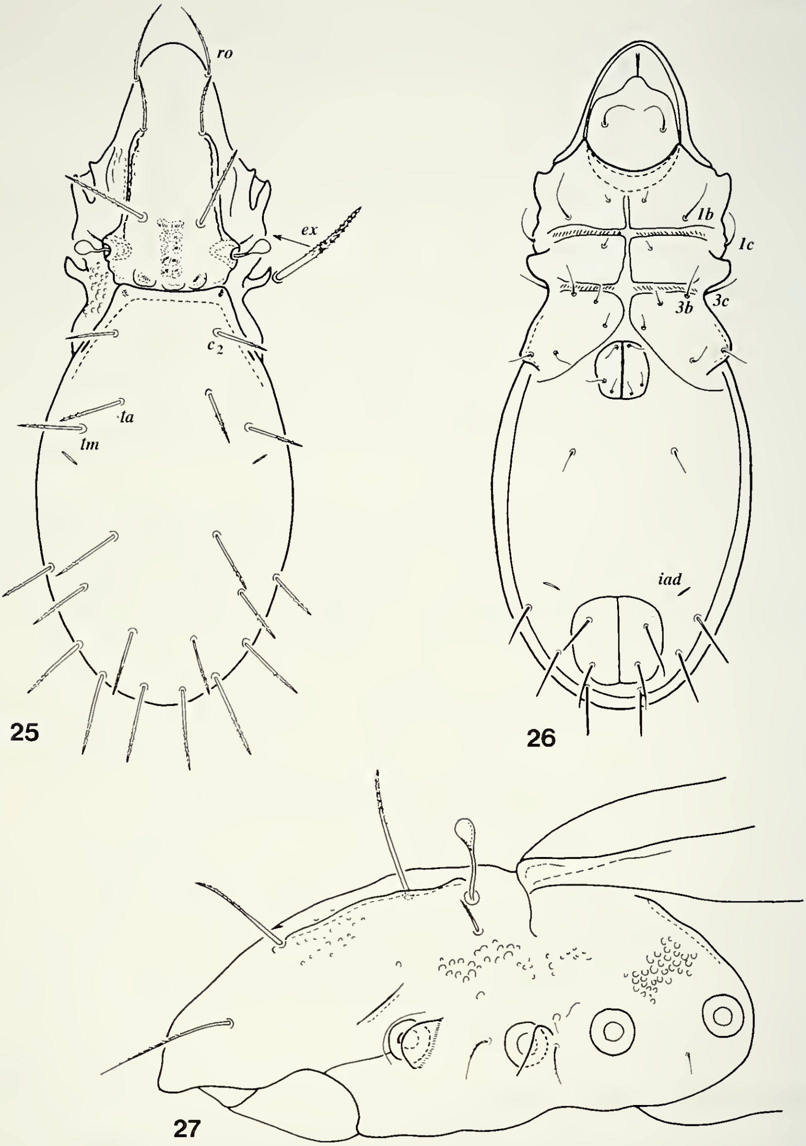
Derivatio nominis: After Tolanaro City (formerly Fort Dauphin) in Northern Madagascar.

Lanceoppia (Bicristoppia) kalalao sp. n. (Figs 28-33)

Material examined: Holotype: Mad-89/54, 1 paratype from the same sample. Holotype: MHNG and paratype (1474-PO-93): HNHM.

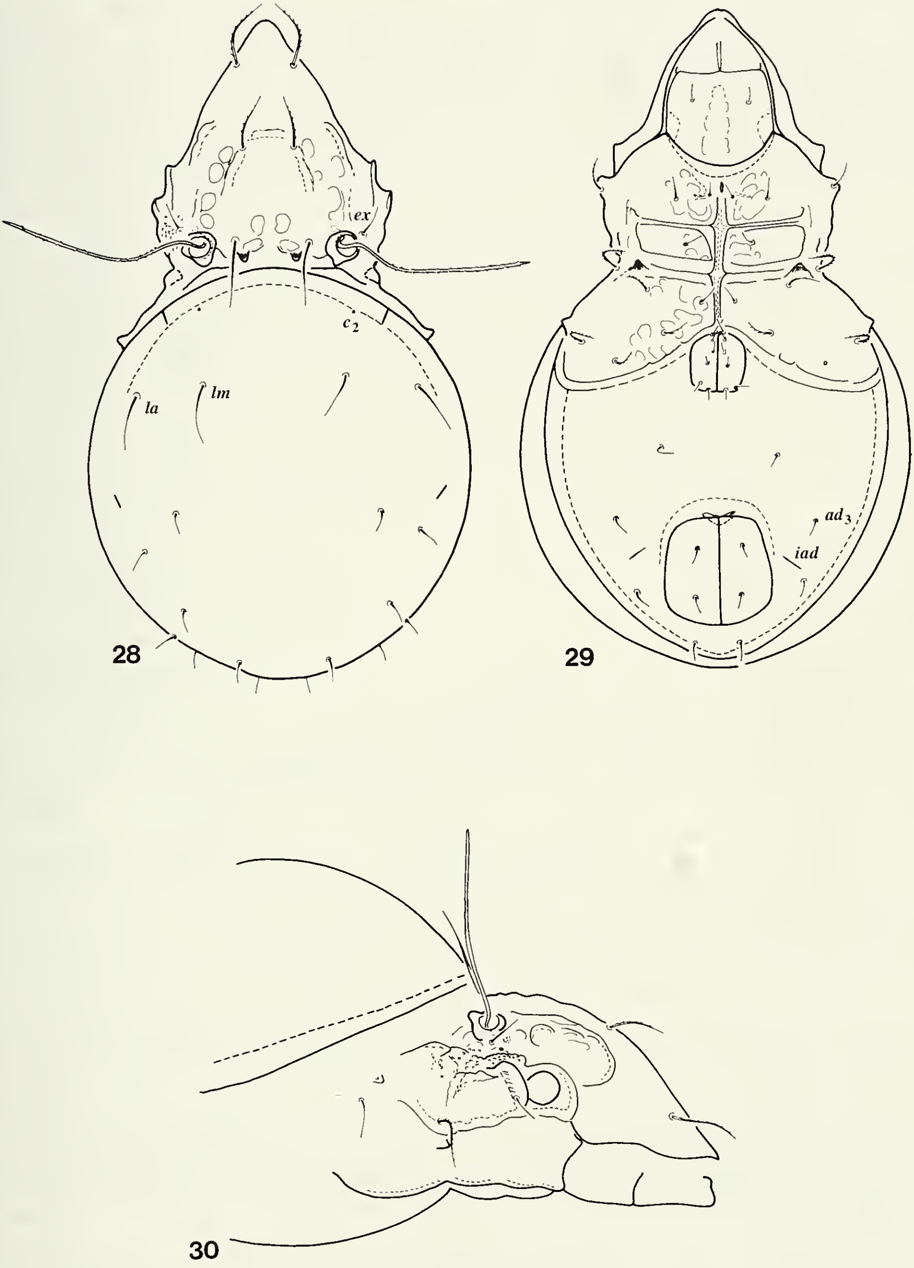
Measurements. - Length of body: 285-327 µm, width of body: 184-202 µm.

Prodorsum: Rostrum conical. Lamellar and translamellar lines conspicuous, in the holotype they seem to be true crests (Fig. 28), in the paratype the transline is much weaker. One pair of tubercles and two pairs of spots present in the interbothridial region, characteristic for the subgenus. Some other crests and spots or



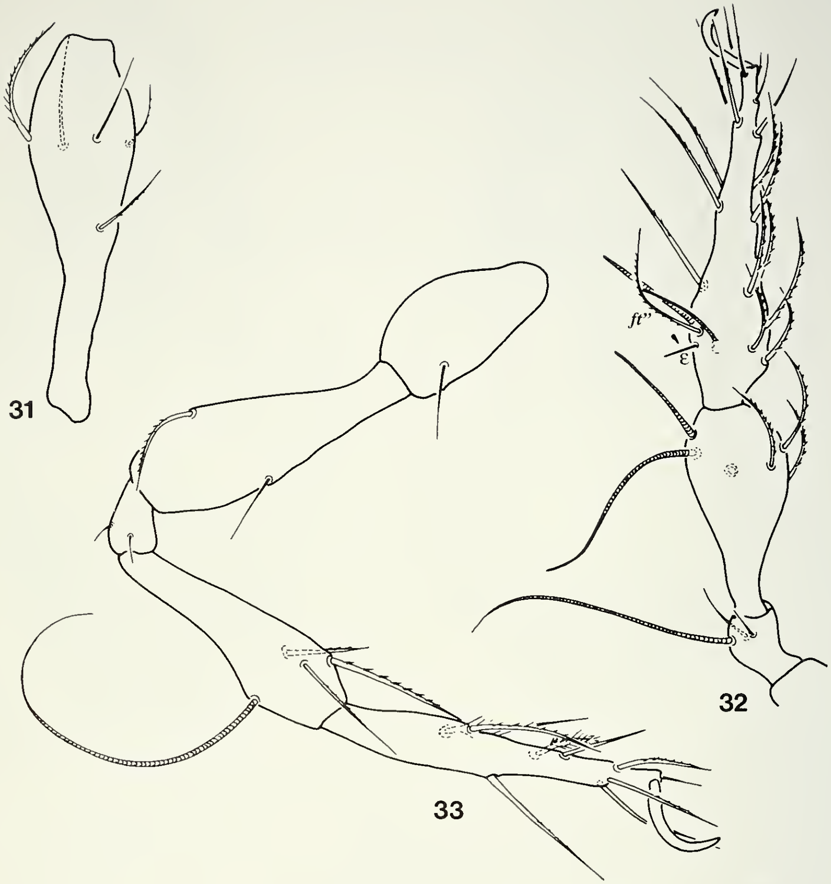
FIGS 25-27

Pseudotocepheus tolanaro sp. n. – 25: dorsal aspect, 26: ventral aspect, 27: podosoma in lateral aspect.



FIGS 28-30

Lanceoppia (Bicristoppia) kalalao sp. n. – 28: dorsal aspect, 29: ventral aspect, 30: podosoma in lateral aspect.



FIGS 31-33

Lanceoppia (*Bicristoppia*) *kalalao* sp. n. – 31: femur of leg I, 32: genu, tibia and tarsus of leg I, 33: leg IV.

alveoli also observable on the prodorsal surface. Rostral setae arising on the prodorsal surface, but comparatively far from each other. Ratio among the prodorsal setae: *in* > *ro* > *le* > *ex*. Setae *ro* and *le* well ciliate, the other two pairs glabrous. Bothridium with a basal knob. Sensillus very long, directed clearly outwards, setiform, with some minute spicules.

Notogaster: Nine pairs of short notogastral setae and the alveoli of the vestigial setae c_2 present. Setae *la* and *lm* inserted nearly on a transversal line, these two pairs approximately twice as long as the other notogastral setae. All fine, setiform.

Lateral region of podosoma: Some crests and a well pustulate field above the acetabula in this region (Fig. 30).

Coxisternal region: Inner margin of the epimeral fields like a tectum. They do not meet medially, between the epimeral fields a sternal fossa present. Other, transversal, epimeral borders well developed, mostly wide, on the sejugal ones a pair of sharp, triangular tubercles observable laterally. Epimeral setae short, mostly well ciliate. Setae *1c* arising on pedotecta 1.

Anogenital region: Genital plates narrow, with 6 pairs of simple genital setae. Anal plates much larger than the genital ones, all setae in this region short. Lyrifissures *iad* in the characteristic inverse apoanal position (Fig. 29).

Legs: All joints of the legs slender, narrow (Figs 31-33). ϵ of tarsus I located posteriorly, behind seta *ft*" and ω_2 (Fig. 32). Tarsus of leg IV bearing two plumose setae (Fig. 33).

Remarks: On the basis of the interbothridial tubercles the new species belongs to the subgenus *Bicristoppia* Subías, 1989. From the heretofore known species the new one is distinguished by the form of the sensillus and the ratio of the notogastral setae.

Derivatio nominis: After the Kalalao primary forest, the name of the collecting site.

Lasiobelba lemuria sp. n. (Figs 34-40)

Material examined: Holotype: Mad-89/29, 8 paratypes from the same sample. Holotype and 5 paratypes: MHNG and 3 paratypes (1475-PO-1993): HNHM.

Measurements. - Length of body: 478-522 μm, width of body: 277-315μm. Male specimens slightly smaller than the females.

Prodorsum: Rostrum conical in dorsal, beak-shaped in lateral, aspect. Lamellae absent, but lamellar setae inserted on small knobs. Interbothridial region well sclerotised, bothridia connected with each other by a darker band, the interlamellar setae arising on anterior margin of the band. Rostral, lamellar, interlamellar and exobothridial setae strong, well ciliate, their ratio: *le* >*in* >*ro* = *ex*. Distances between setae *ro* and between setae *in* subequal; distance between setae *le* only slightly greater (Fig. 34). Sensillus long, slightly broadened medially, cylindrical; well spiculate basally with some longer cilia distally (Fig. 36). Lateral part of prodorsum partly pustulate, this sculpture spreading over the sejugal region laterally.

Notogaster: Semicircular in cross-section. A characteristic longitudinal crest observable on its anteromedian margin. Ten pairs of notogastral setae present, setae c_2 very short and fine, all the others much longer and thicker, but setae *p* in posteromarginal position also shorter than the others.

Lateral region of podosoma: Pedotecta 1 small, pedotecta 2-3 absent, discidium well observable as a triangular apex, but discidial carina absent (Fig. 36).

Coxisternal region: Mental tectum separated from the anterior margin of the coxisternal region. Anterior border of coxisternal region (*bo. 1*) arched inwards, epimeral shields not always touching medially. *bo. 5* strongly arched posteriorly, reaching behind the genital aperture (Fig 35). Epimeral setae simple, but very great differences exist among them. Characteristic feature: setae *1c* short, much shorter than setae *1b* and originating far from pedotecta 1. Setae *1a*, *2a*, and *3a* short and nearly smooth, *3c* and *4c* long and well pilose.

Anogenital region: Genital and anal apertures quite different, the former only half as wide as the latter. Anogenital setal formula: 5 - 1 - 2 - 3. Anal and adanal setae conspicuously long and ciliate. Lyrifissures *iad* in paraanal position.

Legs: All legs long, narrow, slender. Tarsi II-IV with conspicous setae *(u)*, differentiated as strong but short spines, therefore the setal formulae are:

I: 1 - 5 - 2+1 - 4+2 - 20+2 - 1 (Figs 37-38)
IV: 1 - 2 - 2 - 3+1 - 12 - 1 (Figs 39-40).

Remarks: The new species is well characterised by the presence of setae c_2 and the characteristic sculpture of the interbothridial region and on the anterior margin of the notogaster. The type species and most of the heretofore known *Lasiobelba* Aoki, 1959 species have only 9 pairs of notogastral setae, and setae c_2 are represented only by their alveoli. Among the *Lasiobelba* species *L. heterosa* (Wallwork, 1964) has 10 pairs of notogastral setae and a sculptured anterior margin of the notogaster. However, the sensillus of this species is setiform and the notogaster has an excavation. On this basis the new species is readily distinguished from all congeners.

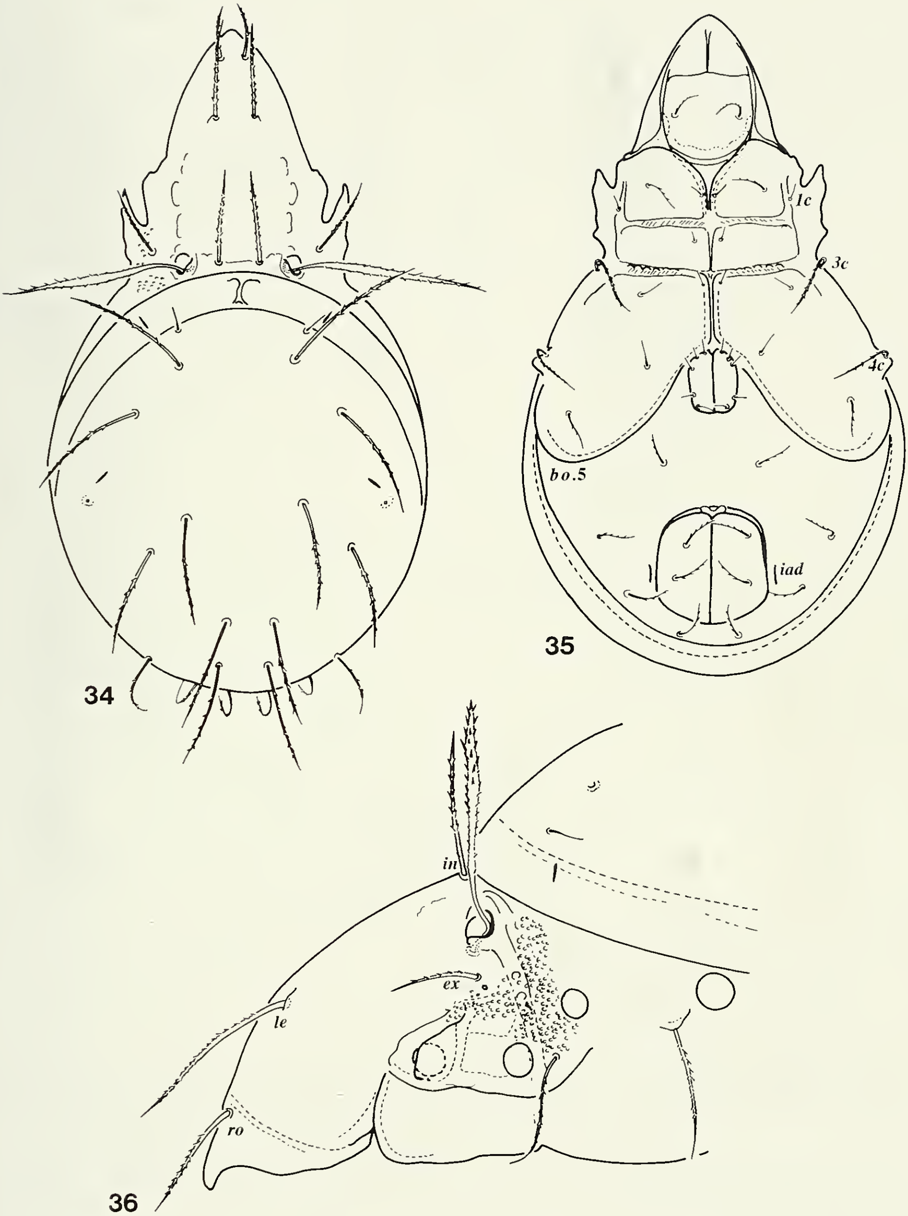
Derivatio nominis: After the Lemurs, a group of Primates endemic to Madagascar.

Leptoppia gen. n.

Diagnosis: Family *Oppiidae*. Body elongated and flat, notogaster not convex. Rostrum divided by two incisions, rostral setae arising on the dorsal surface, far from each other. Lamellar costula absent, but some pustules and a weak lamellar line present. A pair of characteristic vertical interbothridial laths and two pairs of spots present. Sensillus fusiform, pectinate. Ten pairs of notogastral setae present, lyrifissure *ia* in transversal position, far from the dorsosejugal margin. Coxisternal region strongly elongated posteriorly, the acetabula of leg IV very far from leg III. Epimeral border 4 arched far behind the genital aperture. Discidium absent. One pair of smaller, and one pair of stronger tubercles present on the sejugal borders. Anogenital setal formula: 5 - 1 - 2 - 3. Setae ad_3 in preanal, lyrifissure *iad* in inverse apoanal position. All legs with normal "oppioid" characters.

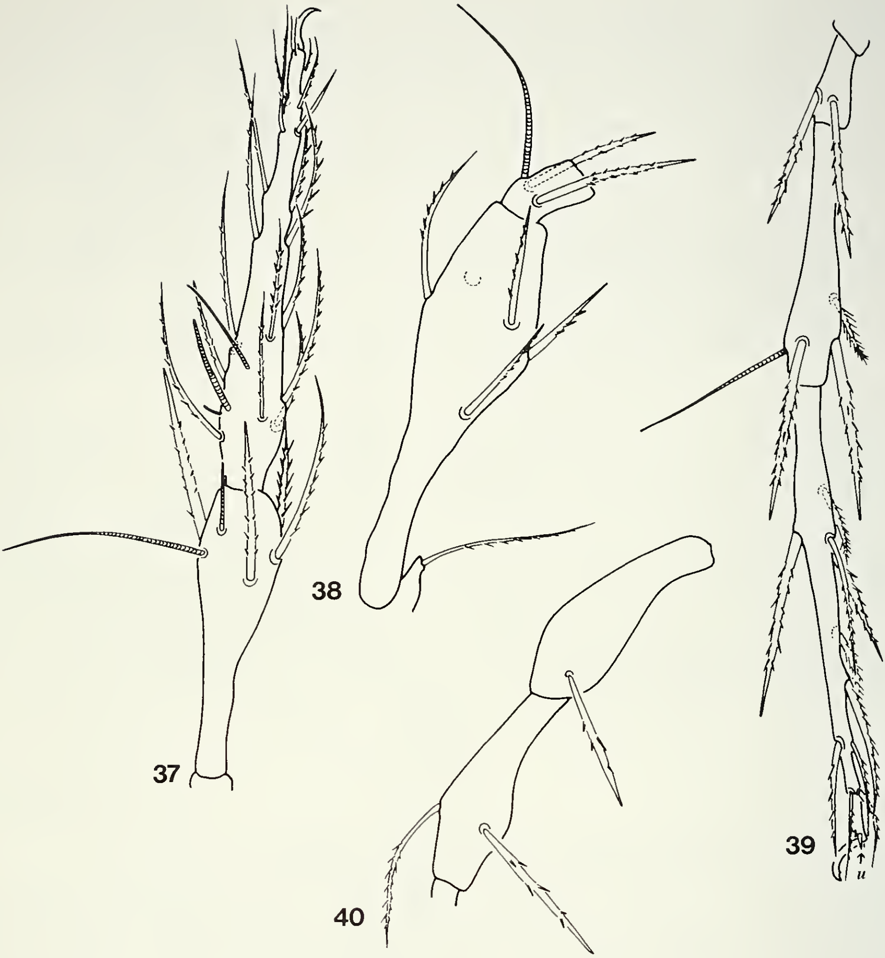
Type species: *Leptoppia procera* sp. n.

Remarks: Some of the main characters of this taxon resemble those known in the genera *Brachioppia* Hammer, 1961 and/or *Gittella* Hammer, 1961. However, these genera are characterised by a rounded rostral apex, and by the position of the acetabula. The new genus differs from them by the position of the lyrifissures *ia* and the strong lateral apophysis in the sejugal region.



FIGS 34-36

Lasiobelba lemuria sp. n. – 34: dorsal aspect, 35: ventral aspect, 36: podosoma in lateral aspect.



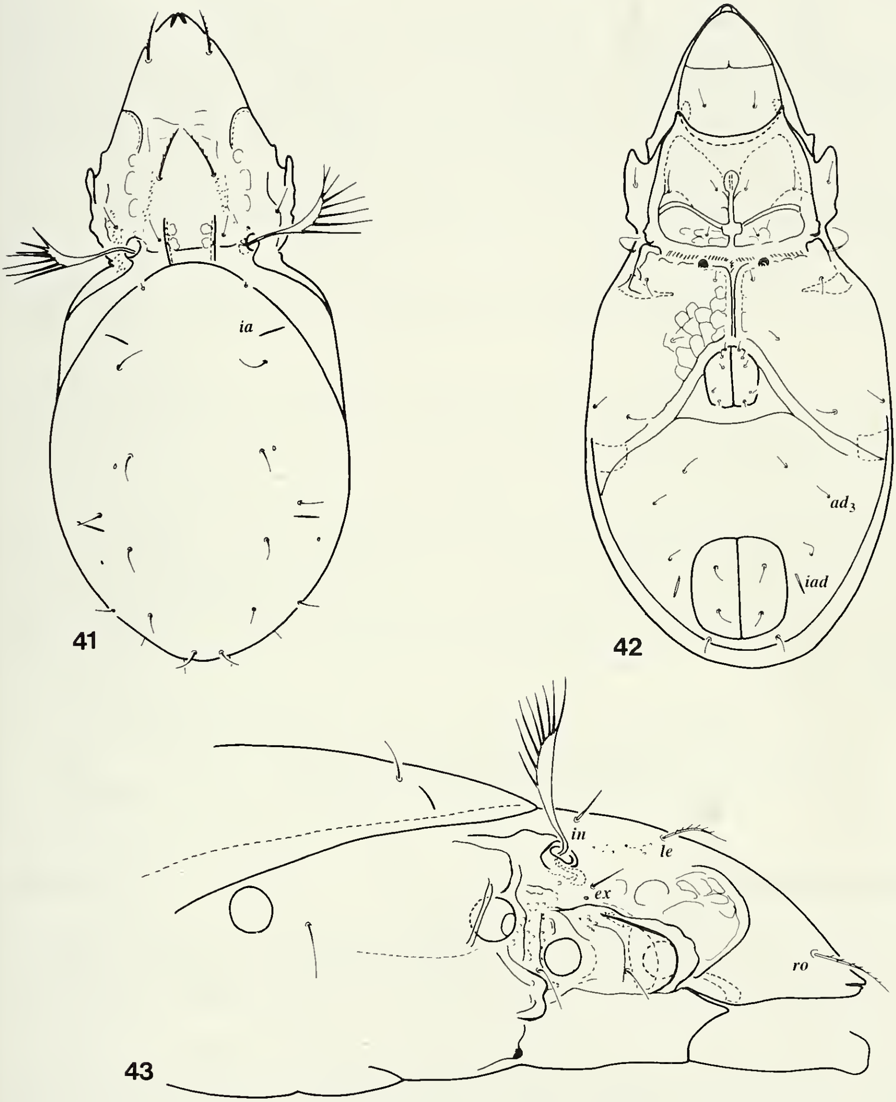
Figs 37-40

Lasiobelba lemuria sp. n. – 37: tibia and tarsus of leg I, 38: femur and genu of leg I, 39: genu, tibia and tarsus of leg IV, 40: trochanter and femur of leg IV.

Derivatio nominis: from the Greek word λεπτοζ (leptos) = elongated, narrow, slender.

Leptoppia procera sp. n. (Figs 41-43)

Material examined: Holotype: Mad-89/15, 18 paratypes from the same sample; 1 paratype: Mad-89/19. Holotype and 12 paratypes: MHNG and 7 paratypes (1476-PO-93): HNHM.



FIGS 41-43

Leptoppia procera gen. n., sp. n. – 41: dorsal aspect, 42: ventral aspect, 43: podosoma in lateral aspect.

Measurements. - Length of body: 250-278 µm, width of body: 111-128 µm.

Prodorsum: The median apex of the incised rostrum the same size as the lateral apices. Prodorsal surface ornamented by various sculptures: a pair of costuliform laths arched laterally, median part with some weak rugae in front of the insertion of the lamellar setae, some pustules ordered in longitudinal rows in the lamellar position, some light spots in exolamellar and two pairs in interbothridial position and a pair of strong longitudinal laths also in interbothridial position (Fig. 41). Ratio among the prodorsal setae *ro* >*le* >*in* = *ex*. Sensillus asymmetrically dilated, pectinate, with 7-8 long branches.

Notogaster: Ten pairs of short and simple notogastral setae present. Among them setae c_2 minute, setae c_2, *la*, *lm* and *lp* arising nearly in longitudinal rows.

Lateral region of the podosoma: Pedotecta 1 large, pedotecta 2-3 very small, but a well-developed, anteriorly protruding, large protuberance located behind the acetabulum of leg II (Fig. 43). Sejugal region and a part of the exobothridial region sparsely pustulate.

Ventral regions: Apodemes and the epimeral borders well developed, but sternal apodeme and border not reaching the mentum, ending in a clavate structure. Sejugal borders especially wide, with two pairs of tubercles directed anteriorly. Epimeral border 4 directed posteriorly, well arched, following the displacement of the acetabulum of leg IV behind the genital aperture (Fig. 42). Anogenital setal formula: 5 - 1 - 2 - 3. All setae in this region very short. Lyrifissures *iad* in inverse apoanal position.

Legs: The tibia and tarsus of leg IV bearing one strong spiniform seta.

Remarks: See the remarks after the generic diagnosis.

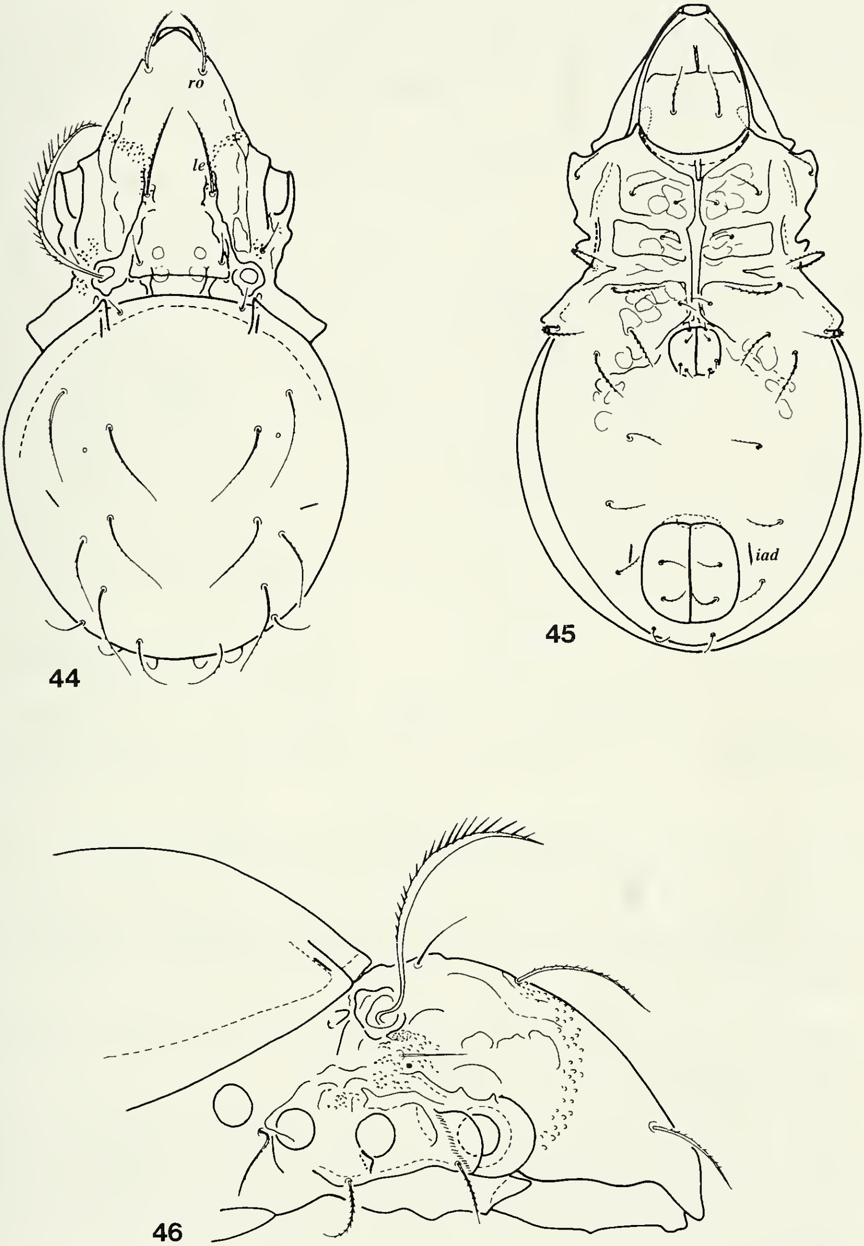
Derivatio nominis: After the elongated form of the notogaster.

Oxyoppia pustulata sp. n. (Figs 44-48)

Material examined: Holotype: Mad-89/52, 3 paratypes from the same sample. Holotype and 2 paratypes: MHNG an 1 paratype (1477-PO-93): HNHM.

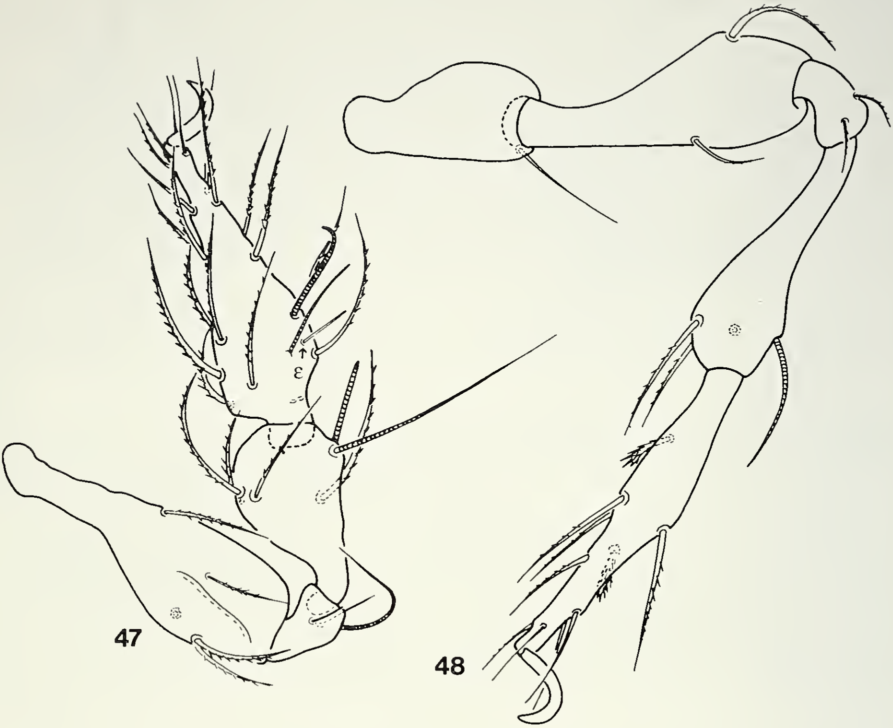
Measurements. - Length of body: 242-267 µm, width of body: 125-142 µm.

Prodorsum: Rostral apex dilated, blunt in dorsal aspect, beak-shaped in lateral aspect (Fig. 46). Lamellar crests strong, reaching beyond the insertion of the lamellar setae. From this insertion an arching row of pustules runs to the lateral margin (Fig. 44). Translamella absent. Two pairs of interbothridial spots and one pair of wide, longitudinal bridges observable in front of the dorsosejugal region. Bothridium with a basal knob, opposite to it a free tubercle also in the sejugal region (Fig. 46). Among the prodorsal setae, setae *ro* and *le* pilose, setae *in* and *ex* smooth. The ratio among them: *le* >*ro* >*in* = *ex*. Sensillus long, curved forwards and inwards. Exobothridial region pustulate.



FIGS 44-46

Oxyoppia pustulata sp. n. – 44: dorsal aspect, 45: ventral aspect, 46: podosoma in lateral aspect.



Figs 47-48

Oxyoppia pustulata sp. n. – 47: leg I, 48: leg IV.

Notogaster: Humeral process continued in a well developed crista. Ten pairs of notogastral setae of different lengths present, all finely ciliate. Seta c_2 the shortest, directed forwards.

Lateral region of podosoma: Above the acetabula of legs I-III the surface well pustulate and some longitudinal crests observable (Fig. 46). Pedotecta 1 normal, pedotecta 2-3 small, triangular.

Coxisternal region: Epimeral borders, especially the sejugal apodeme – excepting *bo. 4* – conspicuously wide, this latter one short, its lateral part absent, therefore epimere 4 open posterolaterally (Fig. 45). Epimeral plates not touching medially, a wide longitudinal fossa present. Epimeral surface ornamented by irregular spots, laterally some crests also present. Epimeral setae well ciliate, excepting *1a*, *2a* and *3a*.

Anogenital region: Genital aperture small, located far anteriorly, between *bo. 4*. Only four pairs of very short genital setae present. Other setae in the anogenital region longer and all finely ciliate. The direction of the lyrifissures *iad* parallel with the ànal plates, but they are located far from the anal aperture.

Legs: Tibia and tarsus of leg I (Fig. 47) and II wide, knob-shaped, the same joints of legs III and IV (Fig. 48) slender. ϵ of tarsus I conspicuously long, erect, straight, φ_2 on tibia I blunt at tip. Leg setal formulae are typically "oppioid":

I: 1 - 5 - 2+1 - 4+2 - 20+2 - 1
IV: 1 - 2 - 2 - 3+1 - 10 - 1

Two ventral setae of tarsus IV plumose.

Remarks: On the basis of its habitus the new species without doubt belongs to the genus *Oxyoppia* Balogh & Mahunka, 1969. The group of species forming this genus has recently been subdivided by several authors; however, this subdivision is not satisfactory for *O. pustulata*. A further proof how difficult it is to separate the taxa within the family Oppiidae is the fact that the new species has only 4 pairs of genital setae, most of the known *Oxyoppia* species having six pairs. So far the only exception is *O. spiculifera* Mahunka, 1985 which also has 4 setae, although the sensillus of this latter species is different. The new species may readily be distinguished from all the other congeners by the reduction of its hind posterior border.

Derivatio nominis: After the pustules ordered in arching rows on the prodorsum.

Sphagnoppia alata sp. n. (Figs 49-53)

Material examined: Holotype: Mad-89/52, 2 paratypes from the same sample. Holotype and 1 paratype: MHNG and 1 paratype (1478-PO-93): HNHM.

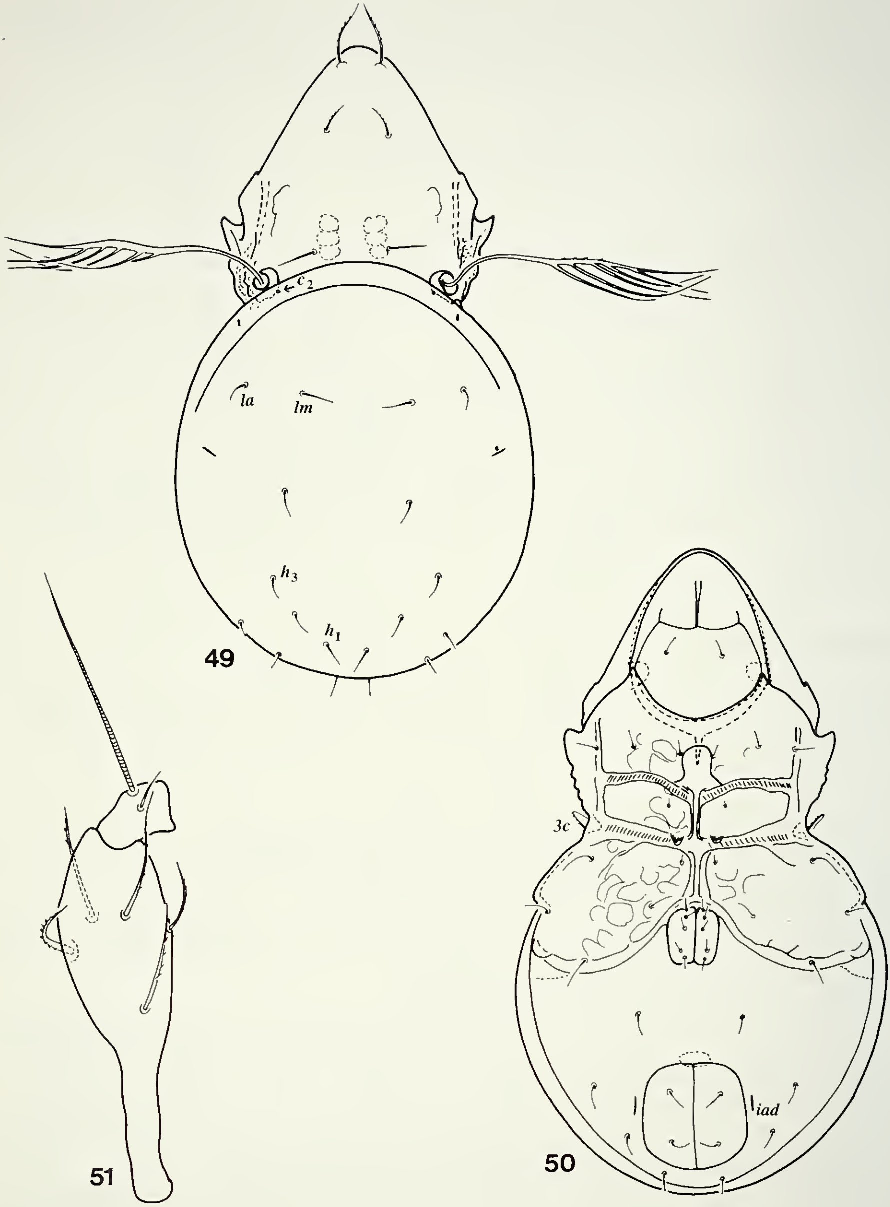
Measurements. - Length of body: 272-289 µm, width of body: 157-169 µm.

Prodorsum: Rostrum widely rounded. Prodorsal surface without lamellar line or crest, three pairs of light spots present in the interbothridial region (Fig. 49). Ratio of the prodorsal setae *ro* >*in* = *ex* >*le*. Setae *ro* well ciliate, setae *le* sparsely ciliate and setiform, with filiform distal end; setae *in* and *ex* straight and smooth, blunt at tip. Sensillus extremely long, with 5 very long branches and some fine spines on the other margin. Exobothridial region pustulate.

Notogaster: Well rounded in dorsal aspect (Fig. 49) and high (nearly semicircular in cross-section) in lateral aspect. Nine pairs of true setae and the alveoli of the vestigial c_2 setae present. All setae short, simple, smooth, no essential difference between them. Seta *lm* arising very far anteriorly, nearly along a transversal line with seta *la*. Setae h_1 - h_3 located near to each other, their insertions form a "V" shaped structure on the posteromedian part of the notogaster.

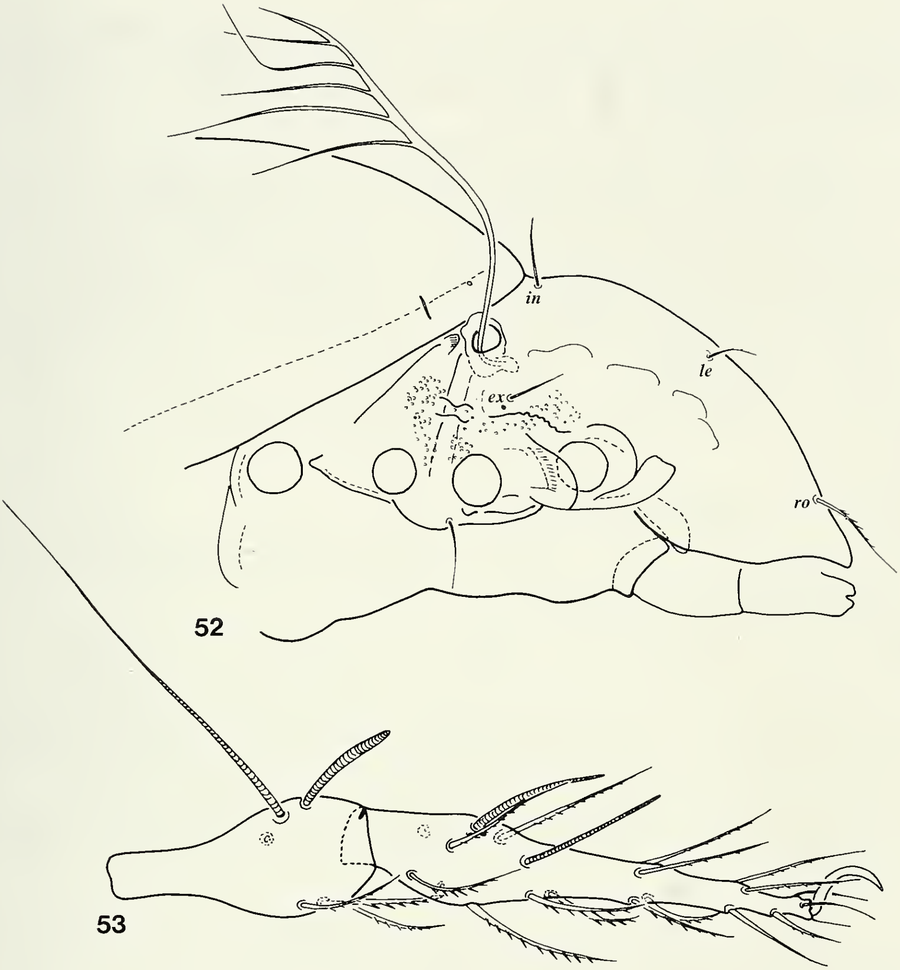
Lateral region of podosoma: Behind the bothridium a tubercle present, on the sejugal suture a transversal band, near to the exobothridial setae a longitudinal crest observable. Pedotecta 1 small, pedotecta 2-3 completely reduced (Fig. 52).

Coxisternal region: Apodemes and epimeral borders well developed (Fig. 50), *bo. 4* characteristically arching posteriorly. Between epimere 1



FIGS 49-51

Sphagnoppia alata sp. n. – 49: dorsal aspect, 50: ventral aspect, 51: femur of leg I.



Figs 52-53

Sphagnoppia alata sp. n. – 52: podosoma in lateral aspect, 53: tibia and tarsus of leg I.

an anteriorly and laterally framed median hollow present. On the sejugal borders one pair of posteriorly directed tubercles visible. Epimeral surface with a weak structure consisting of irregular spots. Epimeral setal formula: 3 - 1 - 3 - 3. All epimeral setae – excepting setae *3c* – simple, setae *3c* the longest of all.

Anogenital region: Genital plates small, anal ones nearly twice as wide and also much longer. Anogenital setal formula: 5 - 1 - 2 - 3. All setae short, anal setae finely ciliate. Lyrifissure *iad* in adanal position.

Legs: All legs long, their joints slender, with the typical oppiid setal formula. Solenidia ω_1 and φ_2 of leg I (Figs 51, 53) characteristically directed inwards. $\varphi 2$ short and well thickened. Solenidium of genu III short and thick, no plumose ventral setae on tibia and tarsus IV.

Remarks: The relationships of the new species are rather problematic. It has some important features (shape of prodorsal setae and sensillus, hollow in the epimeral region, position and number of setae in the anogenital region, etc.) which also characterise the type species of the genus *Sphagnoppia* Balogh & Balogh, 1986. However, some other significant characters (e.g.: the position of the notogastral setae) are quite different and other characters are not known from the type species, because the original description is not complete. In spite of this I provisionally place the new species into this genus.

Derivatio nominis: After the wing-like sensillus.

Rhynchoribates genavensium sp. n. (Figs 54-60)

Material examined: Holotype: Mad-89/29, 5 paratypes from the same sample; 8 paratypes: Mad-89/15. Holotype and 8 paratypes: MHNG, 5 paratypes (1479-PO-93): HNHM.

Measurements. Length of body: 611-667 µm, width of body: 193-417 µm.

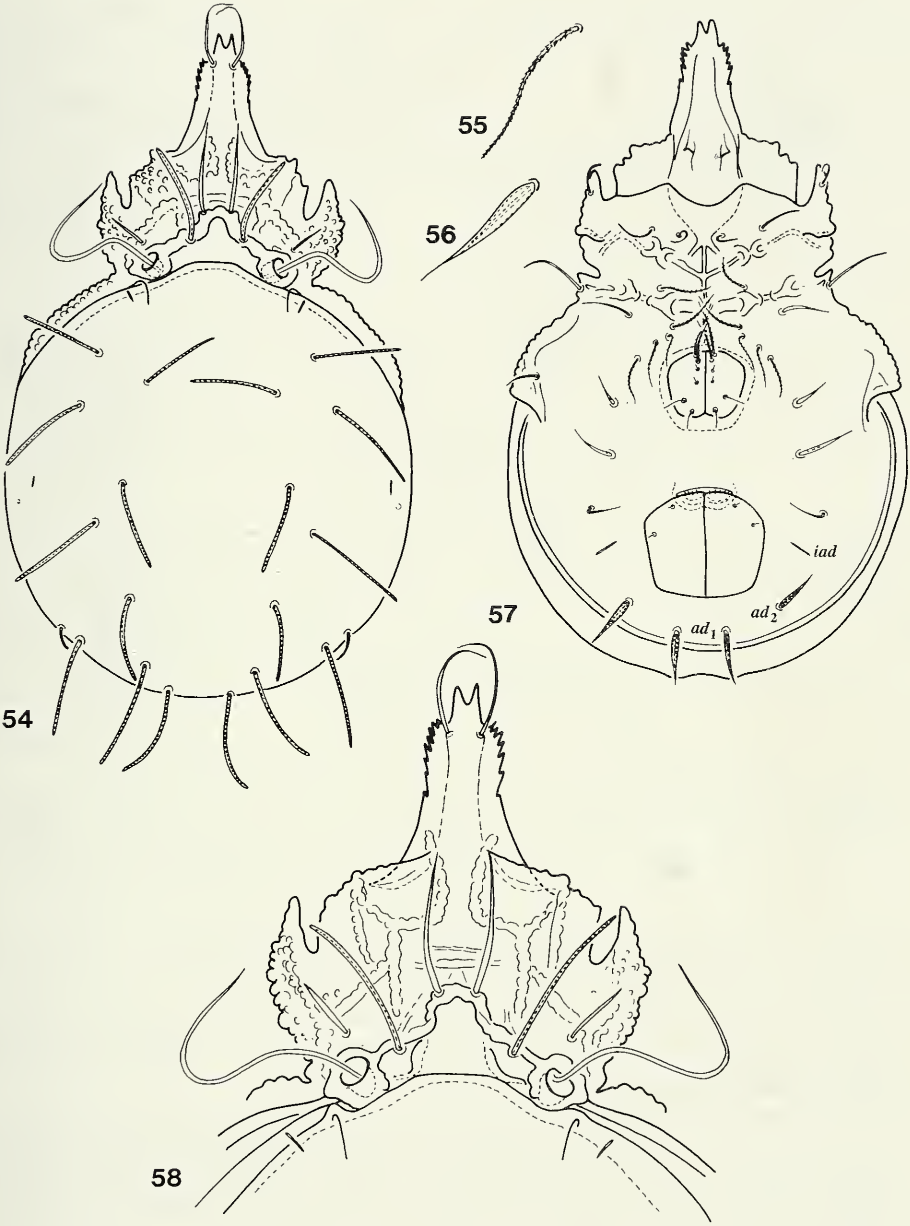
Prodorsum: Rostral apex well protruding, deeply incised. Behind the apex of the rostrum, at the insertion of rostral setae, the rostrum suddenly dilated, and its margin serrated (7 long teeth on each side). Prodorsal surface ornamented by the typical formation of tubercles (Fig. 58) and laths. A strong, median, unpaired crest also present in front of the lamellar knob. Lamellar setae setiform, directed forwards, slightly shorter than the bacilliform interlamellar setae. Sensillus setiform, typically S-shaped.

Notogaster: Dorsosejugal suture strongly convex, projecting between the bothridia anteriorly. One pair of humeral tubercles present. 10 pairs of typical, bacilliform notogastral setae present.

Lateral region of podosoma: Behind the acetabula some crests present, and the surface between the crests and acetabula well pustulate.

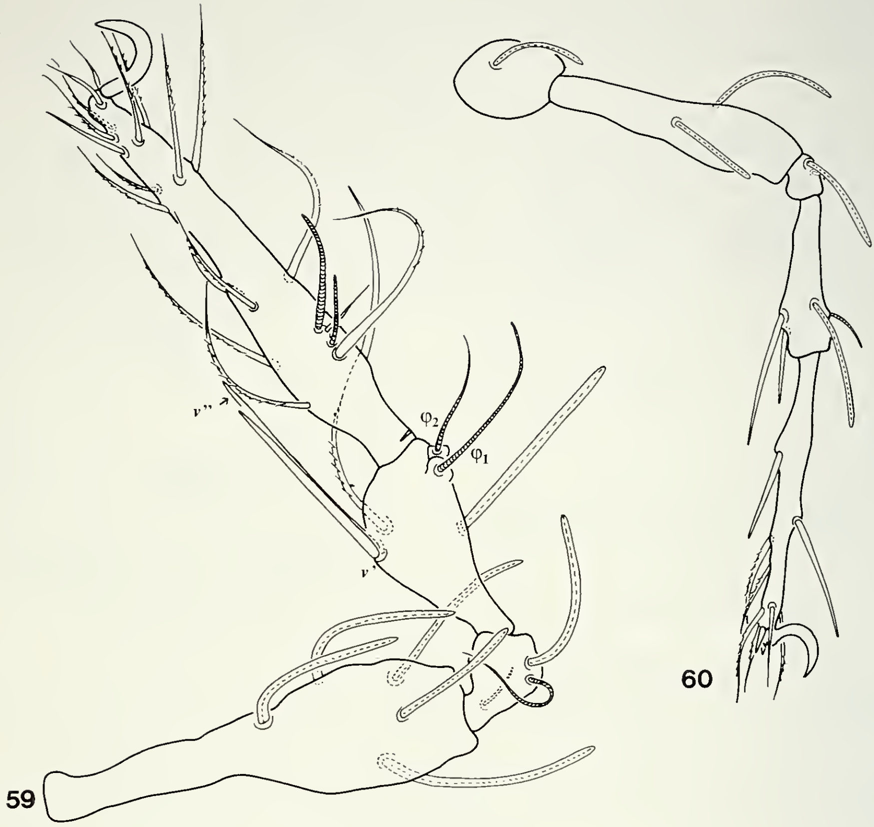
Ventral regions: Apodemes 2 and the sejugal apodeme divided by some transversal crests into subregions (Fig. 57). Epimeral setae mostly spiniform, slightly dilated and smooth. Among them seta *3c* much longer than *4c*. The anterior three pairs of setae of epimere 4 thin and flagellate (Fig. 55). Epimeral setal formula: 3 - 1 - 3 - 5. Six pairs of simple genital setae of varying lengths present, the anterior one being the longest, the median pair the shortest of all. Anal setae minute, the aggenital setae and the two pairs (ad_1, ad_2) of the adanal setae sword-shaped (Fig. 56). Lyrifissures *iad* in apoanal position.

Legs: Solenidia φ_1 and φ_2 of tibia I arising on equally large tubercles (Fig. 59).



Figs 54-58

Rhynchoribates genavensium sp. n. – 54: dorsal aspect, 55: seta *2a*, 56: seta *ag*, 57: ventral aspect, 58: podosoma in dorsal aspect.



FIGS 59-60

Rhynchoribates genavensium sp. n. – 59: leg I, 60: leg IV.

Setae *v'* and *v''* on all tibiae erect, spiniform. All tarsi – excepting tarsus I – bearing spiniform and typically dilated setae (e. g. tarsus IV, fig. 60); on tarsus I only spiniform and setiform setae present.

Remarks: The Ethiopian *Rhynchoribates* Grandjean, 1929 species were recently reviewed by MAHUNKA (1985). The species belong to two species-groups distinguished by a rounded or incised rostrum. Until 1985 three species (*R. montanus* Balogh, 1962, *R. radula* Mahunka, 1983 and *R. subequalis* Balogh, 1962) belonged to the species group with an incised rostrum. Since then only one further species (*R. borhidii* Mahunka, 1986) has been described within this species group. On the basis of the form of rostral incisure the new species stands nearest to *R. montanus*. However, in the new species the rostral incisure is wider and deeper, the rostral teeth greater and longer as in *R. montanus*.

Derivatio nominis: In honour of the staff of the Arthropoda Department of the Geneva Museum.

Passalozetes (Passalozetes) lienhardi sp. n. (Figs 61-64)

Material examined: Holotype: Mad-89/43, 18 paratypes from the same sample; 8 paratypes: Mad-89/49. Holotype and 16 paratypes: MHNG and 10 paratypes (1480-PO-1993): HNHM.

Measurements: Length of body: 239-262 µm, width of body: 125-142 µm.

Integument: Prodorsal surface ornamented by some irregular cells anteriorly, and thin, interrupted, reticular ridges basally. Notogastral surface with similar ridges anteriorly and medially, but pustules are minute and varying in size laterally and posteriorly, also medially among the ridges (Fig. 61). Surface of coxisternal and ventral plates with a similar pattern as anterior surface of notogaster. Genital plates nearly smooth, anal plates ornamented by weak wrinkles.

Prodorsum: Costulae conspicuous, also a weak, convex transcostula visible. Rostral, lamellar and interlamellar setae fine, short, interlamellar setae shorter than the others and arising in a smooth field, without ridges. The rostral and lamellar setae arise at the same distance from each other (Fig. 64). Sensillus (Fig. 61) well ciliate, it seems distinctly barbed.

Notogaster: Lenticulus absent. Notogastral setae comparatively long, these and the porose area well discernible. Areae porosae A_3 observable only from behind (Fig. 63).

Ventral regions: Apodeme weakly developed. Epimeral setae minute, epimeral setal formula: 3 - 1 - 3 - 2. Genital, aggenital, anal and adanal setae also minute, setae ad_1 in postanal and posteromarginal position (Fig. 62). Lyrifissures *iad* conspicuous, mostly irregular, but in all specimens in preanal position.

Legs: All legs tridactylous and heterodactylous.

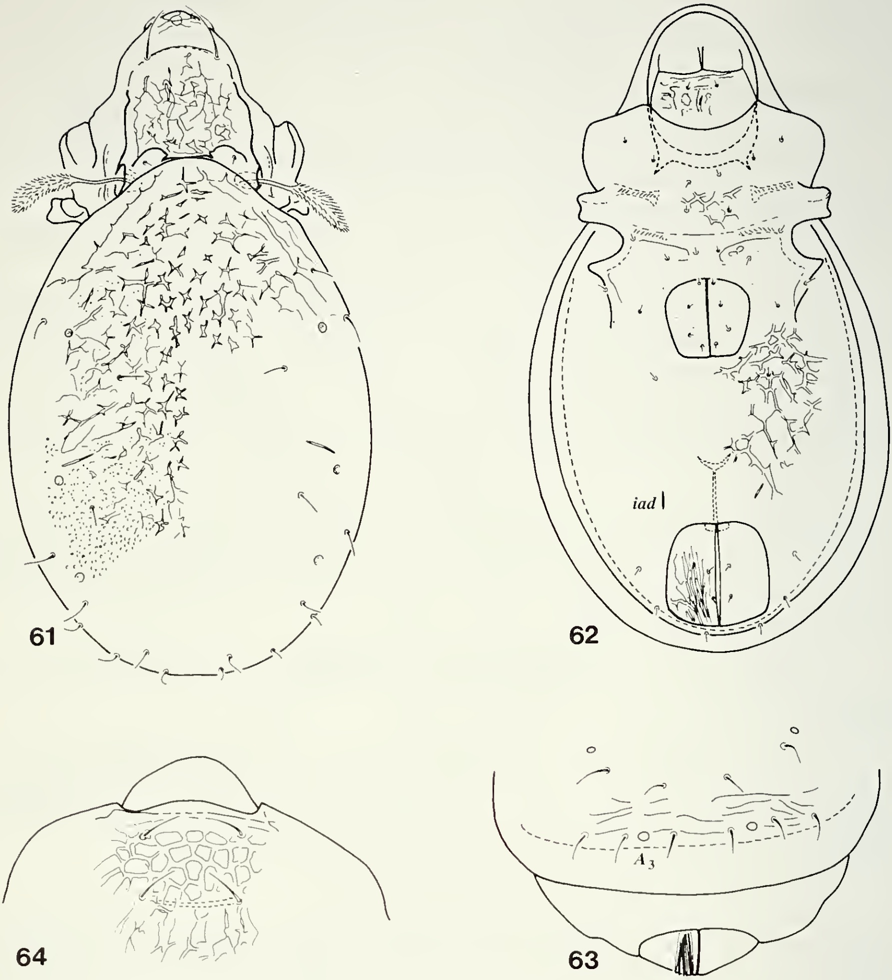
Remarks: On the basis of the number of claws the new species belongs to the nominate subgenus. The form of the sensillus and the sculpture of the notogaster resemble those of the type species (*P. africanus* Grandjean, 1936). However, the new species differs from it by the pustulate posterior part of the notogaster and by the smooth genital plate (well sculptured in *P. africanus*).

Derivatio nominis: I dedicate this new species to Dr. C. Lienhard (Geneva Museum) for his continuous help in the correction of my manuscripts and for his help in the collecting activity of Dr. B. Hauser.

Passalozetes (Bipassalozetes stat. nov.) **berndhauseri** sp. n. (Figs 65-68)

Material examined: Holotype: Mad-89/43, 32 paratypes from the same sample. Holotype and 20 paratypes: MHNG and 12 paratypes (1481-PO-93): HNHM.

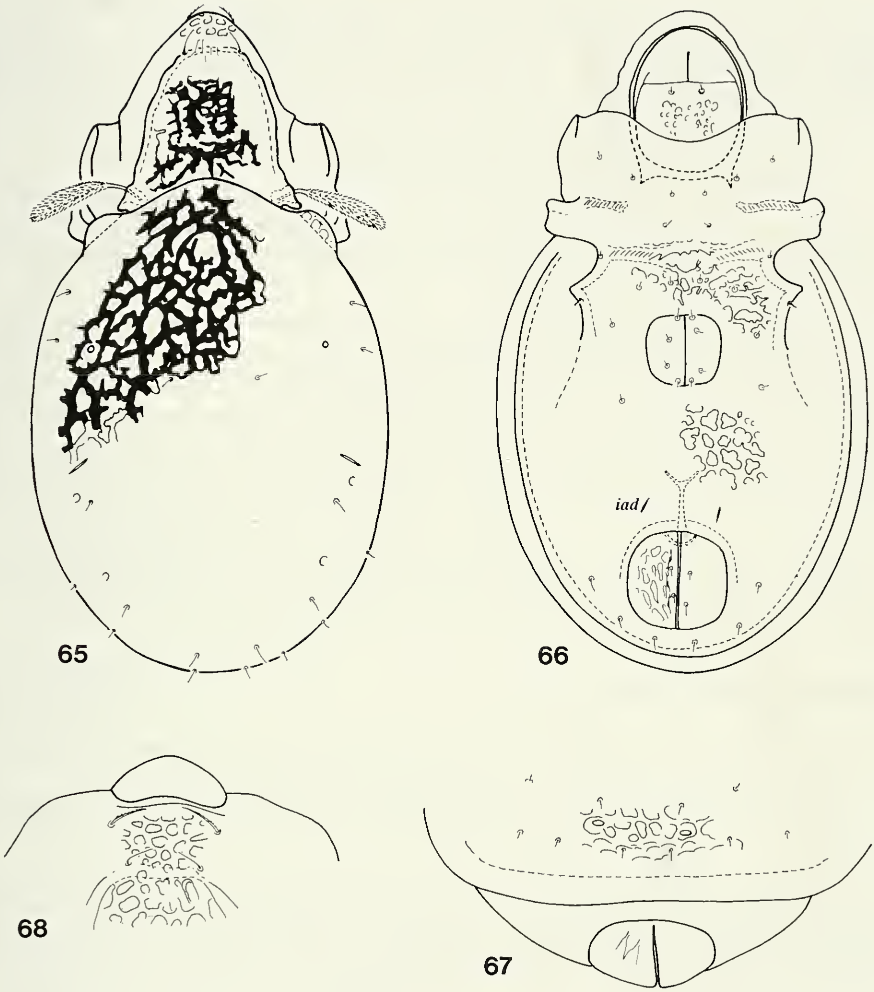
Measurements. - Length of body: 206-234 µm, width of body: 111-128 µm.



FIGS 61-64

Passalozetes (*Passalozetes*) *lienhardi* sp. n. – 61: dorsal aspect, 62: ventral aspect, 63: posteromarginal part of notogaster, 64: rostrum.

Integument: Rostral part of prodorsum polygonate, median and basal part ornamented by irregular, but mostly confluent, and broad ridges. The whole surface of the notogaster ornamented with the same sculpture, but the lower intermediate fields seem to be areolae or with rounded spots. Ventral surface mostly with a similar ornamentation.



FIGS 65-68

Passalozetes (*Bipassalozetes*) *hauseri* sp. n. – 65: dorsal aspect, 66: ventral aspect, 67: posteromarginal part of the notogaster, 68: rostrum.

Prodorsum: Rostral setae well ciliate, lamellar setae smooth (Fig. 68). No smooth field observable around the interlamellar setae. Sensillus with very short bristles, appearing distinctly barbed (Fig. 65).

Notogaster: Lenticulus absent. A well developed projection present on shoulder. All ten pairs of notogastral setae minute, hardly discernible. Porose areas also small (Fig.65), A_3 only observable from behind (Fig. 67).

Ventral regions: In the sejugal region, in front of the genital aperture, a characteristic sculpture observable (Fig. 66). All epimeral setae minute, the epimeral setal formula is: 3 - 1 - 3 - 2. The surface of genital plates nearly smooth; the anal plates with similar, but more compact, ornamentation to the ventral plates. All setae in the anogenital region are minute, lyrifissures *iad* in preanal position.

Legs: All legs bidactylous and heterodactylous.

Remarks: On the basis of the notogastral sculpture the new species stands nearest to *P. pectinatus* Wallwork, 1964; however the form of the sensillus of these two species is completely different: setiform and pectinate in *P. pectinatus*; dilated and distinctly barbed in the new species.

I must remark that the shape of the sensillus has also been used as a differentiating character for supraspecific taxa. On the basis of this character and the number of claws the genus has been subdivided into two genera with *Passalozetes* (having the subgenera *Passalozetes* s. str. and *Passalomonia*) and *Bipassalozetes* (cf. BALOGH & BALOGH 1992). The new species definitely refutes this conception. The separation of the genus *Bipassalozetes* Mihelcic, 1965 is unjustified but, on the basis of the number of claws only, a subdivision of *Passalozetes* into three subgenera is justified.

Derivatio nominis: I dedicate this new species to my friend Dr. Bernd Hauser (Geneva Museum), the Swiss participant of our research programme (OTKA), who organised this successful collecting trip to Madagascar.

Oribatella madagascarensis sp. n. (Figs 69-74)

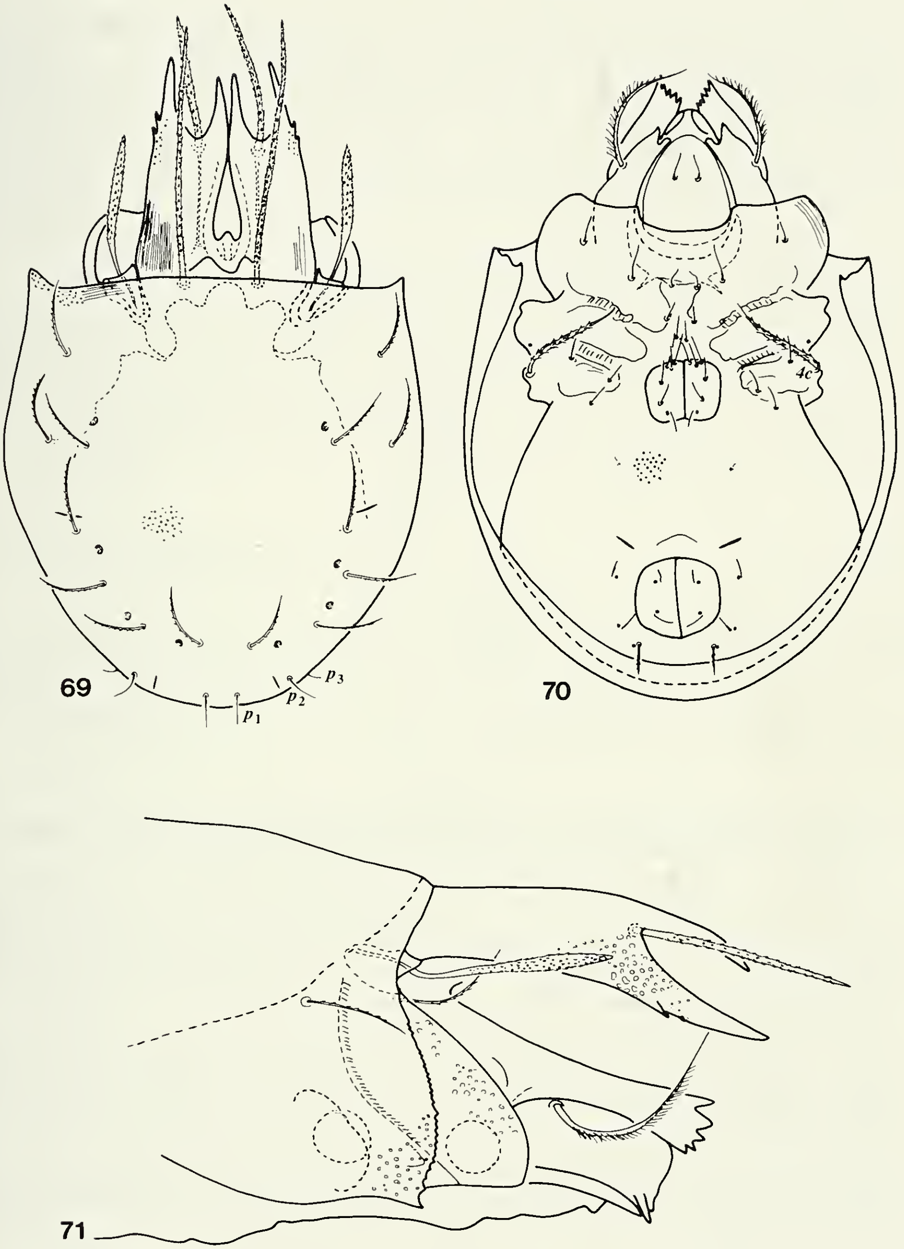
Material examined: Holotype: Mad-89/35, 1 paratype from the same sample. Holotype: MHNG, the paratype (1482-PO-93): HNHM.

Measurements. - Length of body: 320-338 µm, width of body: 223-245 µm.

Prodorsum: Rostral apex (Fig. 73) deeply and widely incised, with a short median apex in this hollow, so that the rostral apex is tripartite, its surface foveolate. The large lamellae connected basally, a well-developed median knob also present. Outer apex distinctly longer than the median one, with 2 sharp and conspicuous teeth on its outer margin. Surface of lamellae having foveolae anteromedially and striae basally and medially. Lamellar setae setiform, arising from the middle of the tutoria, distinctly pilose. Lamellar and interlamellar setae robust, their surface spiculate. Sensillus slightly dilated medially, otherwise similar to the lamellar seta (Fig. 69).

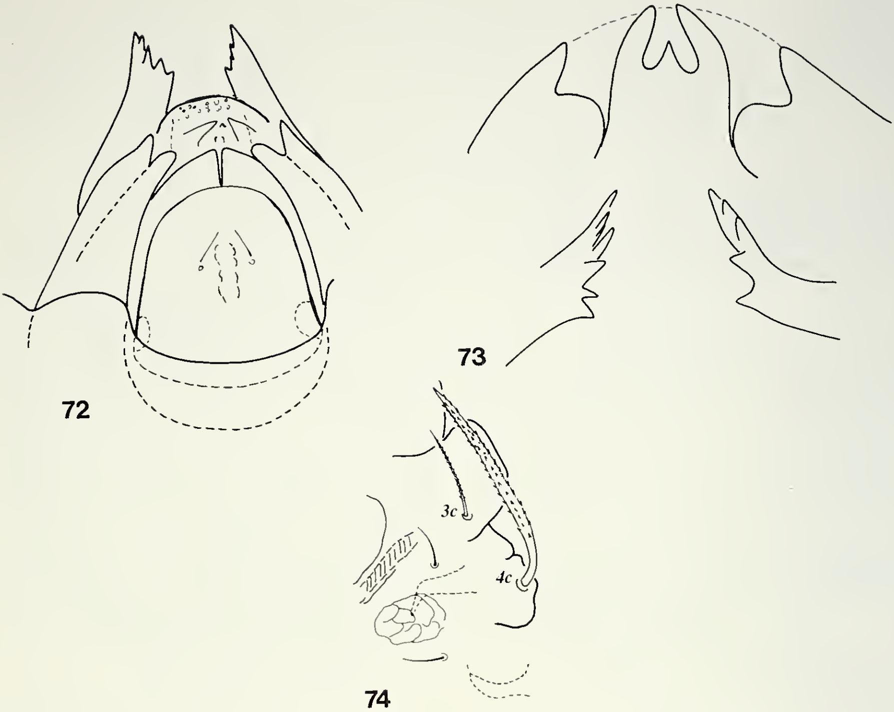
Notogaster: Pteromorphae with well serrated anterior margin (Fig. 71), the surface well foveolate and partly striate. Notogastral surface with finer and smaller sculpture. Four pairs of small areae porosae. Ten pairs of notogastral setae present, 7 pairs of them thicker, longer and more pilose than the other three pairs in posteromarginal position (p_1 - p_3).

Lateral region of podosoma: Pedotecta I and 2-3 large, the first well foveolate. Tutorium narrow, with 5 large teeth on its anterior margin (Fig. 71).



Figs 69-71

Oribatella madagascarensis sp. n. – 69: dorsal aspect, 70: ventral aspect, 71: podosoma in lateral aspect.



FIGS 72-74

Oribatella madagascarensis sp. n. – 72: gnathosoma and rostrum in ventral aspect, 73: rostrum in anterior aspect, 74: lateral part of the epimeral region.

Ventral regions: Mentum large (Fig. 72), its surface smooth. Epimeral surface with smaller, ventral plate with larger foveolae. Epimeral setal formula: 3 - 1 - 3 - 3, their position shown in Fig. 70. Discidium rounded anteriorly, custodium absent (!). Setae *3c* arising on pedotecta 2-3 (Fig. 74), *4c* on discidium, large, thick, pilose.

Legs: All legs monodactylous. Femora II-IV and trochanter III-IV with broad blade- like formation ventrally. On the surface of tibia I, between solenidia φ_1 and φ_2, a sharp apex observable.

Remarks: The new species is well distinguished from all heretofore known species of the genus *Oribatella* by the absence of the custodium and by the form of the rostrum.

Derivatio nominis: After the name of the Island.

Lemurobates gen. n.

Diagnosis: Family *Tegoribatidae*. Habitus like *Tegoribates* Ewing, 1917, prodorsum covered by the characteristically fused lamellae, interlamellar setae absent. Sensillus with long pedicel, directed backwards. Bothridium with double cups which pass into an infundibuliform organ in the body. Pteromorphae movable. Notogaster with porose areas, among them *Aa* located in front of setae *la*. Mentum of "galumnoid" type. Near the gnathosoma an unknown arched, tubular structure observable. Epimeral setal formula 3 - 1 - 3 - 4, setae *1b* and *1c*, as *3b* and *3c* arising directly next to each other. Anogenital setal formula: 5 - 1 - 2 - 3. All legs monodactylous.

Type species: *Lemurobates antsiranana* sp. n.

Remarks: The new genus has some very characteristic features, which have not so far been recorded among Oribatida, e. g. the infundibuliform organ of the bothridium and the tubular structure near to the gnathosoma. Some additional features such as the position of the porose area *Aa*, the position of setae *1a*, *1b* and *3b*, *3c* are also unique within the family Tegoribatidae!

Derivatio nominis: After the Lemurs, a group of Primates endemic to Madagascar.

Lemurobates antsiranana sp. n. (Figs 75-81)

Material examined: Holotype: Mad-89/7, 22 paratypes from the same sample; 2 paratypes: Mad-89/19; 8 paratypes: Mad-89/35. Holotype and 18 paratypes: MHNG and 12 paratypes (1483-PO-93): HNHM and 2 paratypes in the personal collection of Dr. R. A. Norton (Syracuse University, New York, USA).

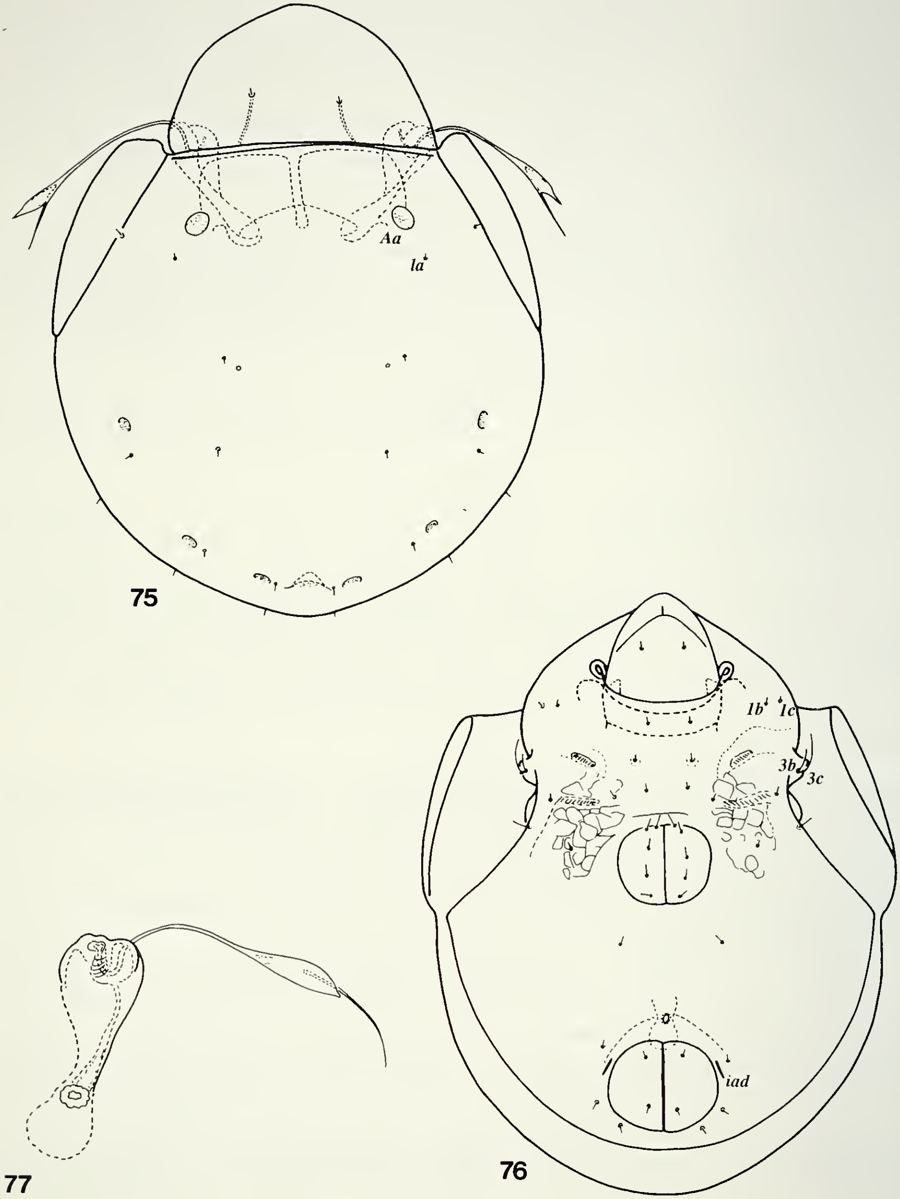
Measurements. - Length of body: 212-229 μm, width of body: 179-191 μm.

Prodorsum: The fused lamellae compose a large shield, lacking a larger hollow medially. It completely covers the prodorsum. Lamellar setae located in the median part of the shield, they are minute. The bothridium seems to be two confluent cups (Fig. 77). Sensillus directed outwards and backwards, long, with a lanceolate head; the ventral margin of this head bears a long, thin spine, reaching over the apex of the capitulum (Fig. 75).

Notogaster: Pteromorphae slightly protruding anteriorly over the dorsosejugal suture, which is almost straight. Four pairs of areae porosae and ten pairs of minute notogastral setae present (I was not able to observe lyrifissures). Among the areae porosae *Aa* much larger than the others, which themselves are nearly equal in size. Posterior margin of notogaster with a small hollow (with pori?) (Figs 75, 81).

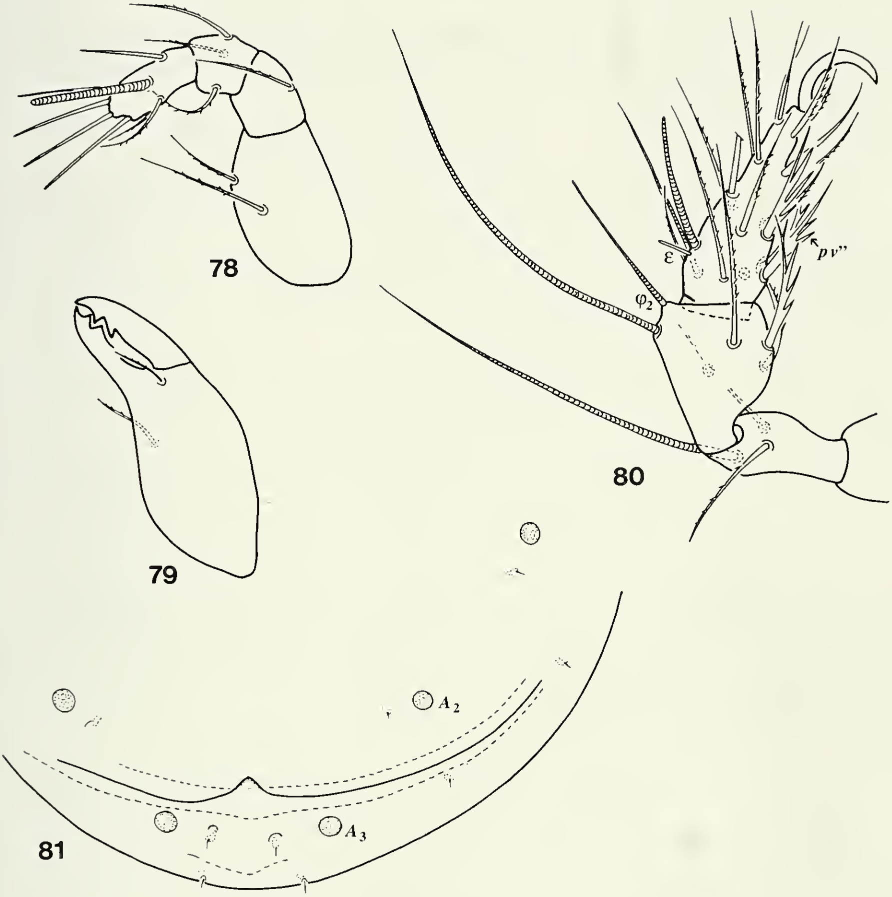
Gnathosoma: Chelicera normal, with very large teeth (Fig. 79). Palpal setal formula: 2 - 1- 3 - 7 + 1. Solenidium ω very long, nearly as long as seta *acm* (Fig. 78).

Ventral regions: Apodemes and epimeral borders weakly developed, mostly reduced. Epimeral surface ornamented by weak polygonate sculpture. Epimeral setae – excepting setae *3c* – short or minute. Anterior margin of genital plates with two pairs of setae. Anogenital setal formula 5 - 1 - 2 - 3. All setae in this region also minute. Lyrifissures *iad* in paraanal position (Fig. 76).



FIGS 75-77

Lemurobates antsiranana gen. n., sp. n. – 75: dorsal aspect, 76: ventral aspect, 77: trichobothrium.



FIGS 78-81

Lemurobates antsiranana gen. n., sp. n. – 78: palp, 79: chelicera, 80: leg I, 81: posterolateral part of the notogaster.

Legs: Some ventral setae of leg I (pv', pv'' of tarsus) with thick and long spines, ε of tarsus I located behind the solenidia. Solenidium φ_2 on tibia I arising on a small tubercle. Leg setal formulae are

I: 1 - 4 - 2+1 - 4+2 - 18+2 - 1 (Fig. 80).
IV: 1 - 2 - 1+1 - 3+1 + 12 - 1

Remarks: Some features are unique in the family Tegoribatidae (see ENGELBRECHT 1986).

Derivatio nominis: After the name of the City Antsiranana, formerly Diego Suarez.

Galumna ankaratra sp.n. (Figs 82-85)

Material examined: Holotype: Mad-89/22, 27 paratypes from the same sample. Holotype and 17 paratypes: MHNG and 10 paratypes (1484-PO-93): HNHM.

Measurements. - Length of body: 342-360 µm, width of body: 250-267 µm.

Prodorsum: Rostrum conical. Lamellar line much thinner than sublamellar one, lamellar setae arising between these lines (Fig. 84). Rostral and lamellar setae short, fine and smooth. Interlamellar setae represented only by their alveoli. Sensillus robust, pectinate, with an asymmetric, lanceolate head which bears 7-8 strong and long branches on its outer margin (Fig. 82). Areae porosae dorsosejugales large, gradually narrowing laterally.

Notogaster: Dorsosejugal suture interrupted medially, between the dorsophragmatic apophyses (*hy*). Median pore present also in the females (!). Ten pairs of alveoli of the vestigial notogastral setae present. Lyrifissure *im* located medially, conspicuously near to each other (Fig. 82). Areae porosae adalares (*Aa*) elongated transversally, only slightly incrassate laterally. All other three pairs of porose areas rounded, no essential difference between them.

Ventral regions: Epimeral region typical for this genus, but a conspicuous transversal band present above the genital plates. Six pairs of genital setae, 2 pairs of which are inserted near the anterior margins of the genital plates. All setae in the anogenital region very fine and short. A distinct, ovally elongated, large area porosa postanalis present (Fig. 83).

Legs: The position of the basal setae and the solenidium of tarsus and tibia I shown on Fig. 85.

Remarks: The new species is well characterised by the striking shape of its sensillus. On this basis it stands nearest to *G. comparabilis* Engelbrecht, 1972 among the Ethiopian *Galumna* species; however, *G. comparabilis* differs from the new species by the form of the areae porosae *Aa* (elongated in the new species) and the length of the branches of the sensillus (shorter in *G. comparabilis*).

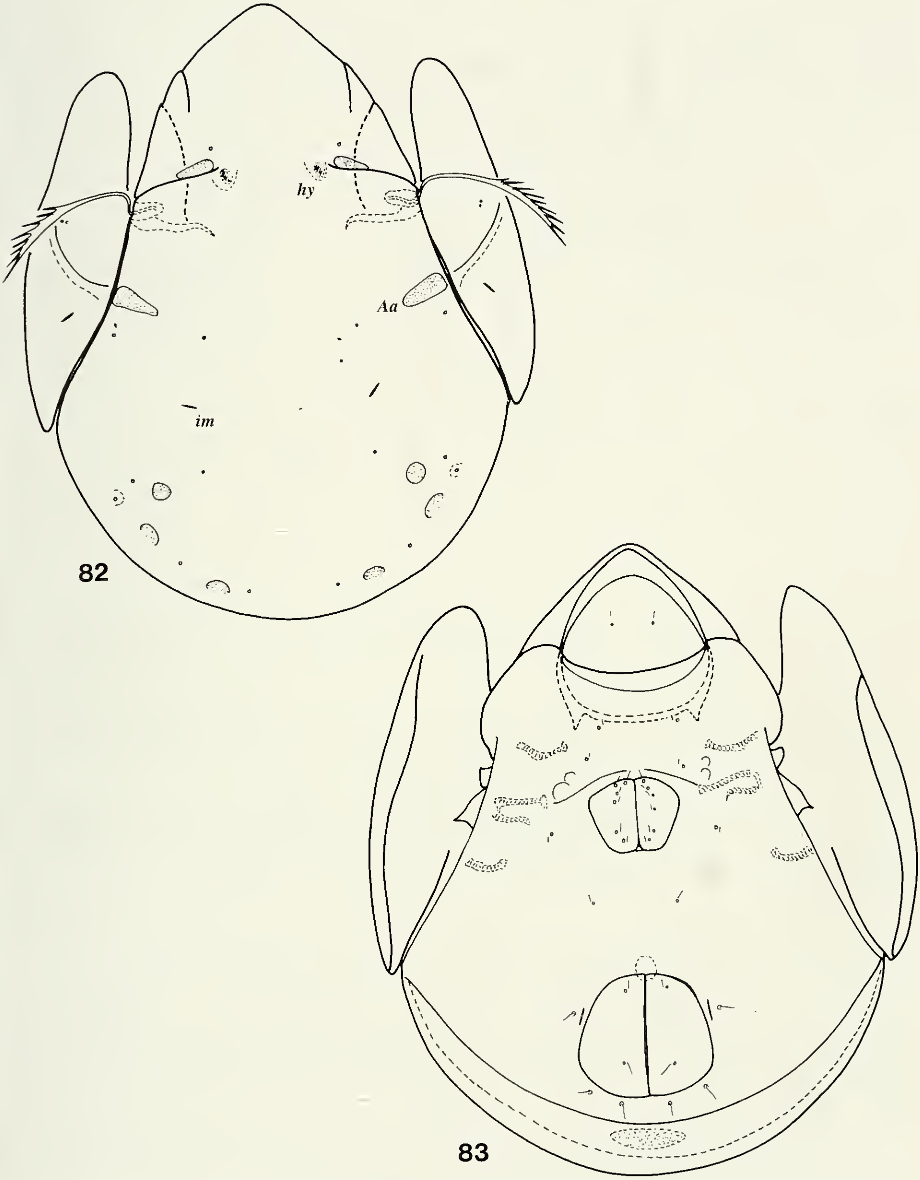
Derivatio nominis: After the name of the Ankaratra Massif, where this interesting material was collected.

Galumna engelbrechti sp. n. (Figs 86-90)

Material examined: Holotype: Mad-89/35, 26 paratypes from the same sample. Holotype and 16 paratypes: MHNG and 10 paratypes (1485-PO-93): HNHM.

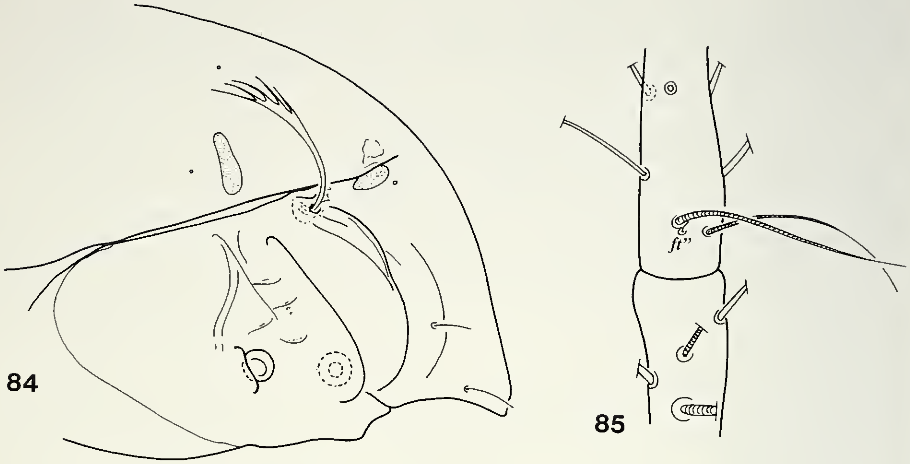
Measurements. - Length of body: 266-283 µm, width of body: 212-234 µm.

Prodorsum: Lamellar line (*L*) short, sublamellar line (*S*) long and well arched, they slightly diverge from each other (Fig. 88). Dorsosejugal areae porosae large, elliptical. Lamellar setae short, rostral setae slightly longer, interlamellar setae



FIGS 82-83

Galumna ankaratra sp. n. – 82: dorsal aspect, 83: ventral aspect.



Figs 84-85

Galumna ankaratra sp. n. – 84: podosoma in lateral aspect, 85: group of solenidia of leg I.

represented only by their alveoli. Sensillus very long with an elongated head. Its distal end having some (5-7) small spines (Fig. 86).

Notogaster: Dorsosejugal suture absent between the dorsophragmatic apophyses of the notogaster. Ten pairs of small alveoli present. Areae porosae *Aa* narrow, long, directed transversally. All others round, nearly equal in size. Lyrifissures *im* located medially (Fig. 86).

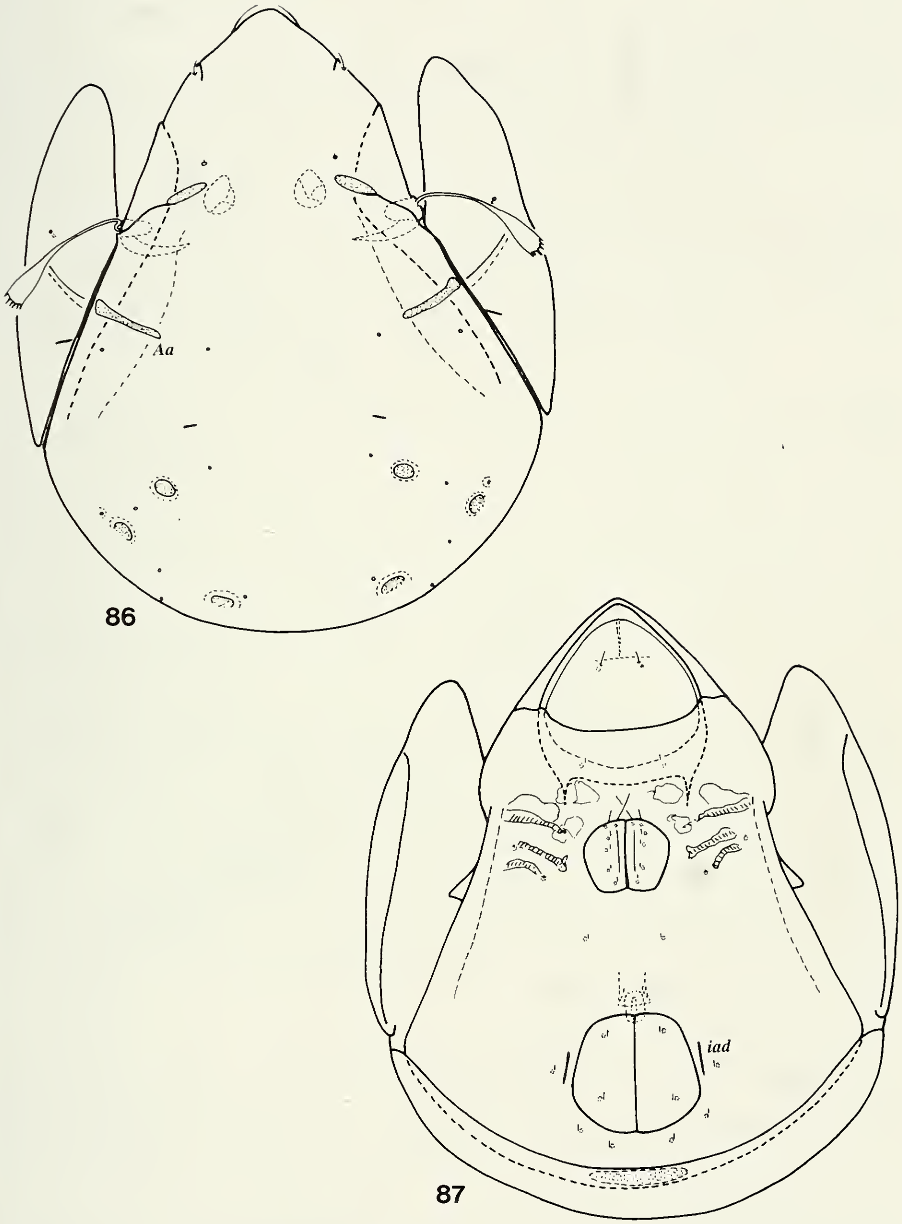
Lateral regions of podosoma: Surface behind the sublamellar line with polygonate sculpture. Lines *T* and *E* strong, converging (Fig. 88).

Ventral regions: Epimeral surface with some spots, all epimeral setae minute (Fig. 87). 6 pairs of genital setae, 2 pairs of which arise on the anterior margins of the genital plates. Genital plates with one pair of longitudinal lines, near to the inner margin. All setae in the anogenital region also minute, their position and the lyrifissures *iad* shown on Fig. 87.

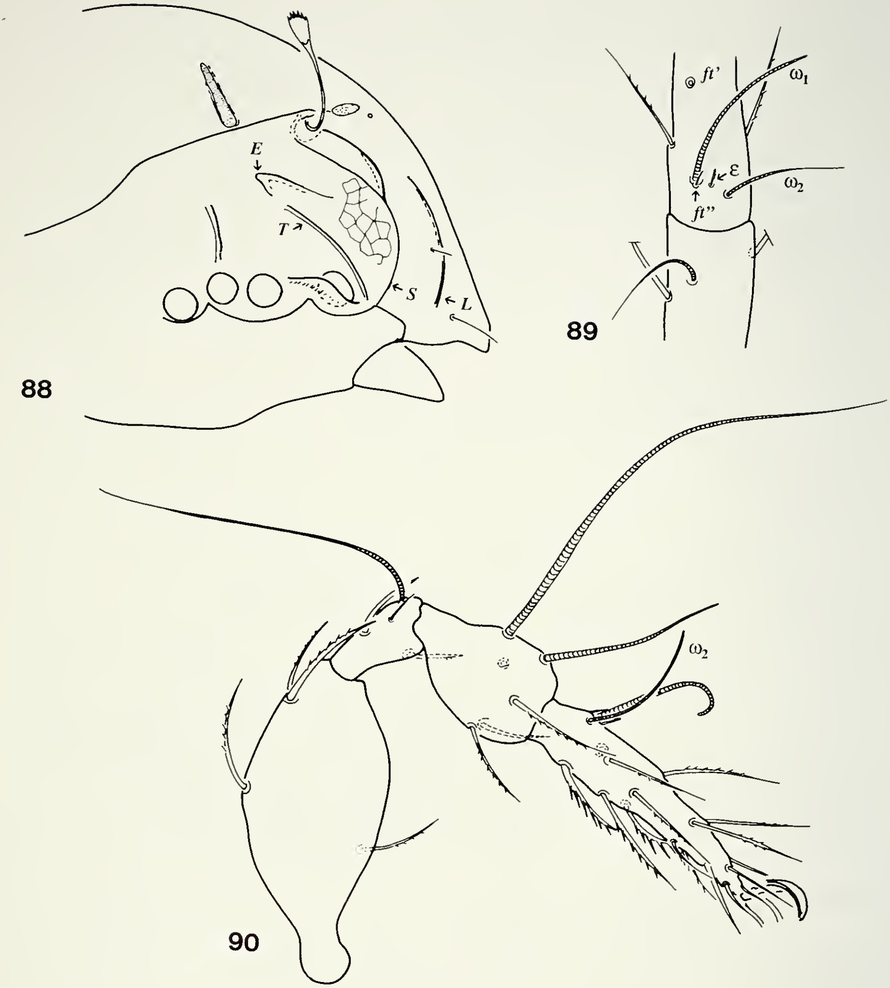
Legs: Chaetotaxy of the legs having "galumnoid" characters. Tarsus I with solenidium ω_2 posteriorly (Fig. 89). Leg setal formulae are

I: 0 - 4 - 3+1 - 4+2 - 19+2 - 3 (Fig. 90)
IV: 1 - 2 - 2 - 3+1 - 12 - 3.

Remarks: The taxonomic position of this new species is rather problematic because the median area porosa is absent in both sexes. In spite of this fact, in my opinion it belongs to the genus *Galumna* von Heyden, 1826. The new species



FIGS 86-87
Galumna engelbrechti sp. n. – 86: dorsal aspect, 87: ventral aspect.



FIGS 88-90

Galumna engelbrechti sp. n. – 88: podosoma in lateral aspect, 89: group of solenidia of leg I, 90: leg I.

differs from all heretofore known species of this genus by the especially narrow porose area *Aa*, and the form of the sensillus. The direction of the lamellar and sublamellar lines are also very characteristic.

Derivatio nominis: I dedicate the new species to Dr. C. M. Engelbrecht, Director of the National Museum, Bloemfontein, for his excellent work on African Oribatida.

Galumna tuberculata sp. n. (Figs 91-95)

Material examined: Holotype: Mad-89/29, 9 paratypes from the same sample. Holotype and 5 paratypes: MHNG and 4 paratypes (1486-PO-93): HNHM.

Measurements. - Length of body: 424-474 µm, width of body: 331-370 µm.

Prodorsum: Lamellar (*L*) and sublamellar (*S*) lines conspicuous, slightly convergent (Fig. 93). Lamellar and rostral setae short, glabrous and fine, interlamellar setae absent, represented only by their alveoli. Sensillus long, directed outwards, its head lanceolate, this part slightly asymmetric, unilaterally ciliate (Fig. 91). Areae porosae dorsosejugales large.

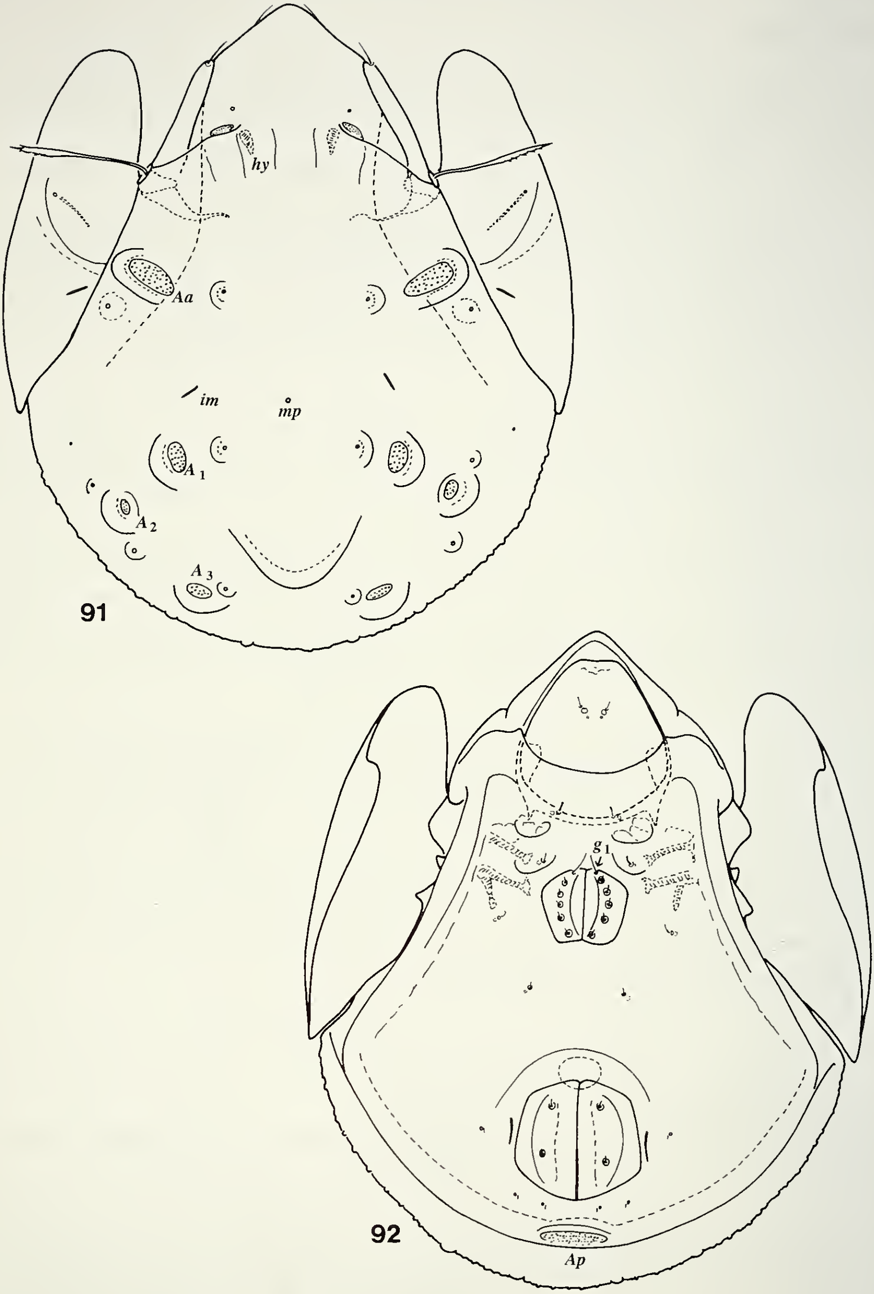
Notogaster: Dorsosejugal suture interrupted between the areae porosae dorsosejugales and the dorsophragmatic apophyses *hy*. Behind this region some longitudinal wrinkles observable, surface of notogaster with large and well sclerotised protuberances; some of them observable around the porose areas, others at the alveoli of the vestigial setae and one, the largest of all, in the posterior part of the notogaster medially. Among the porose areas *Aa* is the largest and elongated transversally. Of the other three pairs A_1 and A_2 are located near to each other, A_1 much larger than the others. Median pore (mp) present in the male specimens. Lyrifissures *im* located slightly more medially than normally, so they are situated characteristically near to each other (Fig. 91).

Ventral regions: Epimeral setation deficient, epimeral surface ornamented by some weak spots. Only one pair of setae arising on the anterior margin of genital plates, all others inserted along a longitudinal line behind it (Fig. 92). Seta g_1 comparatively long, its basis simple, the other 5 simple, very short, with an annular formation at their bases. All other setae in the anogenital region very short and simple, all seem to be rigid. Anal plates with a strongly protruded, longitudinal median "blade" (Fig. 95). A distinct, large and oval area porosa postanalis (*ap*) present. Among the adanal setae ad_1 and ad_2 inserted behind the anal aperture, setae ad_3 and lyrifissures *iad* located in adanal position.

Legs: The position of the basal setae and the solenidium of tarsus and tibia I shown in Fig. 94.

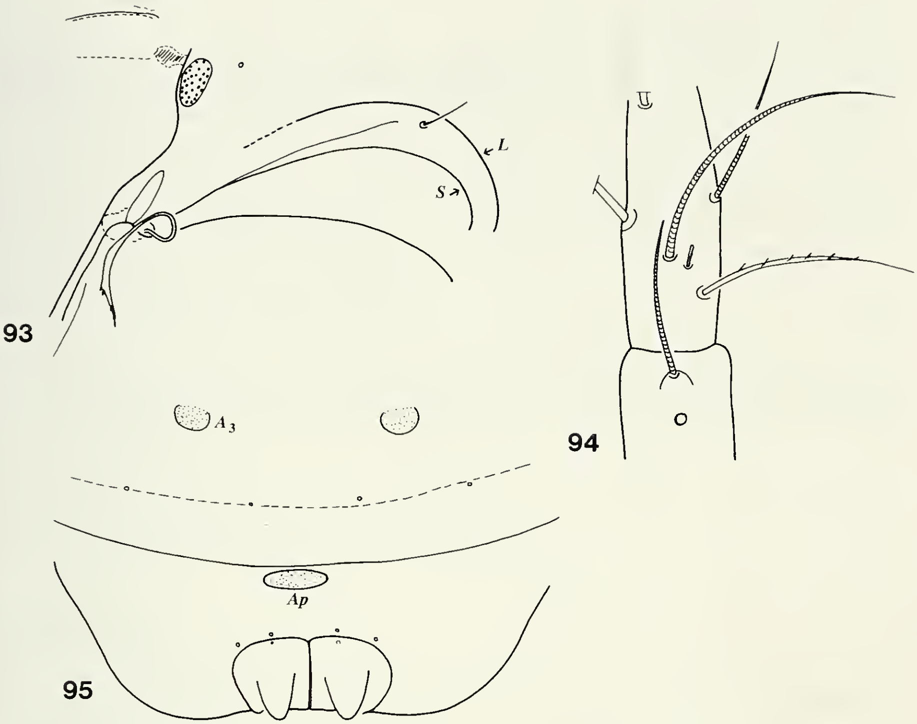
Remarks: The notogastral structure of the new species is unique in the family Galumnidae.

Derivatio nominis: After the structure of the notogaster consisting of large tubercles.



FIGS 91-92

Galumna tuberculata sp. n. – 91: dorsal aspect, 92: ventral aspect.



FIGS 93-95

Galumna tuberculata sp. n. – 93: dorsosejugal and lamellar region in anterolateral aspect, 94: group of solenidia of leg I, 95: body in posterior aspect.

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REVUE SUISSE DE ZOOLOGIE 104 (1): 171-183; mars 1997

Weitere Regenwürmer (Oligochaeta) aus der Volksrepublik Kongo

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Further earthworms from the Congo Republic (Oligochaeta).- Twenty-two species of terrestrial Oligochaeta were studied. They are distributed in 14 genera and 4 families. Three new species *Xibaro pauliani*, *Xibaro lavellei* and *Chuniodrilus congoensis* are described.

Key-words: Earthworms - Moniligastridae - Almidae - Ocnerodrilidae - Eudrilidae -Taxonomy - Congo-Region.

EINLEITUNG

In vorausgehenden Arbeiten (ZICSI & CSUZDI 1986 *a*, *b*, 1989, CSUZDI 1992) sind verschiedene Regenwurm-Familien, die von den Teilnehmern (Dr. J. Balogh, Dr. A. Zicsi & Dr. S. Endrödy-Younga) der Ungarischen Bodenzoologischen Expedition von 1963/1964 gesammelt wurden, aus der Volksrepublik Kongo bekannt gegeben worden. In der vorliegenden Arbeit sollen die Vertreter weiterer Regenwurm-Familien wie Moniligastridae, Almidae, Ocnerodrilidae sowie die bisher nicht veröffentlichten Vertreter der Familie Eudrilidae angeführt werden. Ausserdem wird noch weiteres Material berücksichtigt, das von Prof. P. Lavelle, Paris, in diesem Gebiet gesammelt oder uns durch seine Vermittlung aus dieser Region zur Bestimmung überlassen wurde. Ihm spreche ich auch an dieser Stelle meinen besten Dank aus. Für einen Arbeitsplatz im Naturhistorischen Museum von Genf, wo die Bearbeitung des Materials z. T. erfolgte, wird der Direktion sowie Herrn Cl. Vaucher bestens gedankt. Die Arten sind in der Sammlung des Tiersystematischen und Oekologischen Lehrstuhl der Universität Budapest (AF), Belegexemplare auch im Naturhistorischen Museum Genf (INVE) aufbewahrt.

FUNDORTLISTE

Da die Fundorte sich häufig wiederholen, fassen wir die 6 Hauptfundstellen in einer Liste zusammen und beziehen uns bei der Anführung der bekannten Arten nur auf die Nummern dieser Liste und geben dazu die Inventarnummer unserer

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Manuskript angenommen am 18.04.1996

Sammlung an. Nur bei den für die Wissenschaft neuen Arten führen wir die Fundortsangaben an. Ueber weitere Angaben wird auf die von Balogh et al. (1965) zusammengestellte Fundortliste verwiesen.

I. Meya, in der Umgebung von Kindamba, W-NW von Brazzaville (S.3° 50' 19" - O. 14° 30' 08") vom 29. X.-14. XI. 1963
  I/1. Galeriewald des Louolo-Flusses, 2. XI.
  I/2. Umgebung der Adam-Höhle, Bachbett, 5. XI.
  I/3. Umgebung der Adam-Höhle, Regenwald, 7. XI.
  I/4. Bangu Regenwald, 9.-12. XI.

II. Sibiti, 5 km entfernt von der Stadt in der Umgebung des Institute de Recherches pour les Huites et Oleagineux (IRHO) und beim Bouenza-Wasserfall und dessen Umgebung (S. 3° 40' 22" - O. 13° 20' 23") vom 23. XI.-3. XII. 1963
  II/1. Regenwald in der Umgebung der Forschungsstation IRHO 24.-27. XI.
  II/2. Oelpalmen-Plantagen in der Umgebung der Forschungsstation IRHO 26. XI.
  II/3. Ufer des Storage-Sees, 26. XI.
  II/4. Ufer des Zanzi-Flusses, Galeriewald, 28. XI.
  II/5. Beim Bouenza Wasserfall, Regenwald, 30. XI.

III. Loudima, landwirtschaftlich bebaute Gebiete, Plantagen (S. 4° 10'00" - O. 11° 34' 04") vom 4. XII.-15. XII. 1963
  III/1. In verschiedenen Obstplantagen, 6. XII.
  III/2. Wiese, unter organischem Dünger, 8.-11. XII.
  III/3. 20 km nördlich von Loudima, Galeriewald, 9. XII.

IV. Reservat Mt. Fouori, an der Grenze von Gabon (S. 2° 38' 00" - O. 11° 34' 04") vom 12.-15. XII. 1963
  IV/1. Regenwald, 14. XII.
  IV/2. Savanne, 13.-14.XII.

V. Reservat Lefinie (S. 2° 30' 00" - O. 15° 29' 00") vom 5.-14. I. 1964
  V/1. Am Ufer des Nanbouli-Flusses, Galeriewald, 11. I.

VI. Brazzaville und Umgebung (S. 4° 10' 38" - O. 15° 10' 28") vom 16.-28. X. 1963, 15.-22. XI. 1963, 15. XII. 1963 - 4. I. 1964 und vom 15.-21. I. 1964
  VI/1. Im Park der Forschungsstation Office de la Recherche Scientifique et Technique Outre-Mer (ORSTOM), 18. X., 20. XI., 21. XII., 19. I.
  VI/2. Bakongo, Ufer des Kongo-Flusses. 19. X.
  VI/3. Ufer des Filon-Baches und Bachbett, 23. X.
  VI/4. Djoure-Fluss, Flussbett und Ufer, 25. X.
  VI/5. 25 km westlich von Brazzaville Ufer des Kongo-Flusses, 20. XII.
  VI/6. ORSTOM, äusserer Park, Bachrand, 21. XII.
  VI/7. ORSTOM, äusserer Park, ausgetrockneter Teich, 23. XII.
  VI/8. 30 km westlich von Brazzawille, Forêt Classée, Regenwald, 26. XII.
  VI/9. 30 km westlich von Brazzawille, Forêt Classée, Bachbett, 26. XII.

VII. Volksrepublik Kongo, Mayombe, Station Dimonika, 1984 leg. P. Lavelle.

BESCHREIBUNG DER ARTEN

Moniligastridae Claus, 1880

Drawida Michaelsen, 1900

Drawida bahamensis (Beddard, 1893)

Fundort: VI/8. AF/905 1 Ex..

ALMIDAE Duboscq, 1902

Alma Grube, 1855

Von verschiedenen Fundorten liegen uns zahlreiche Exemplare aus dieser Gattung vor. Leider ist der grösste Teil der Tiere juvenil oder nur praeadult und so mit Sicherheit nicht bestimmbar. Auch bei den adulten Tieren ist eine vollkommene Geschlechtsreife der Tiere mit Sicherheit nicht festzustellen. Wie aus der einschlägigen Literatur ersichtlich (JAMIESON 1971), erfolgte die Erstbeschreibung vieler Arten auf Grund nicht vollkommen adulter Tiere, so dass eine Bestimmung von neuem Material auf besonders grosse Schwierigkeiten stösst.

In Brazzaville und Umgebung sind z. T. auch adulte Tiere erbeutet worden, die zu *Alma millsoni millsoni* oder zu *Alma millsoni* zebangui gestellt werden, obwohl sie nicht in allen Kennzeichen auch diesen übereinstimmen.

Alma millsoni millsoni (Beddard, 1891)
Fundorte: VI/7. AF/189 4 Ex., AF/194 8 juv. Ex..

Alma millsoni zebangui Duboscq, 1902
Fundorte: VI/6. AF/190 19 Ex., 22110 INVE 2 Ex., AF/198 3+4 juv. Ex..

Alma emini (Michaelsen, 1892)
Fundort: VII/1. AF/202-203 5 Ex., 22111 INVE 1 Ex..

Alma sp. juv..
Fundorte: VI/3. AF/197 11 Ex., VI/4. AF/204-205 41 Ex., VI/8. AF/201 1 Ex., VI/9. AF/191-192 4 Ex., II/5. AF/196 2 Ex., I/2. AF/199 8 Ex., III/3. AF/200 3 Ex..

OCNERODRILIDAE Beddard, 1891

Da die Zahl der Gattungen innerhalb dieser Familie zur Zeit nahezu 30 beträgt und die Arten der verschiedenen Genera z. T. durch Verschleppung auch weltweit verbreitet sind, stösst man bei der Einreihung von neuem Material desöfteren auf Schwierigkeiten. Aufgrund dessen und da die neueren Gattungsrevisionen (Gates 1962, 1966, 1973, JAMIESON 1963a, RIGHI 1994) Kennzeichen berücksichtigen, die nicht bei allen Arten überprüft werden konnten, kann die Zugehörigkeit zu den revidierten Genera mit Sicherheit nicht bestimmt werden. Da meine Artenkenntnisse hauptsächlich auf Gattungen beruhen, deren Vertreter peregrin verbreitet sind (*Ocnerodrilus* Eisen, 1878, *Ilyogenia* Beddard, 1893, *Nematogenia* Eisen, 1900, *Eukerria* Michaelsen, 1935), kann ich den neu aufgestellten Gattungen gegenüber nicht immer mit Sicherheit Stellung beziehen.

Wie bekannt, sind Gattungen mit 2 Muskelmagen vor den Hodensegmenten bei den holoandrischen wie auch bei den meroandrischen Arten beschrieben worden. Bei den holoandrischen Arten liegen diese im 6. und 7. Segment (*Bauba* Righi, 1980, *Xibaro* Righi, 1981) oder im 7. und 8. Segment (*Nannodrilus* Beddard, 1894, *Gordiodrilus* Beddard, 1892, *Dorgiodrilus* Gates, 1962). Bei den meroandrischen

Formen liegen diese Organe im 6. und 7. Segment (*Nematogenia* Eisen, 1900, *Temanonegia* Gates, 1979).

Interessant ist es, dass die holoandrischen Formen mit einem Muskelmagen im 6. und 7. Segment bisher nur aus Südamerika erwähnt werden, die meroandrischen Formen aber sich durch Verschleppung auf beide Kontinente erstrecken (*Nematogenia* Eisen, 1900). Da auch bei anderen Gattungen Vertreter auf beiden Kontinenten vorkommen (*Ocnerodrilus* Eisen, 1878, *Pygmaeodrilus* Michaelsen, 1890, *Ilyogenia* Beddard, 1893, *Gordiodrilus* Beddard, 1892, *Eukerria* Michaelsen, 1935), scheint die Zugehörigkeit meiner Arten aus der Kongo-Region zu Gattungen, die bisher nur aus Südamerika erwähnt wurden, nicht ausgeschlossen.

Gordiodrilus Beddard, 1892

Mit der Revision dieser Gattung haben sich GATES (1942) und JAMIESON (1963 *a*, *b*) befasst. Der letztere hat die Arten dieser Gattung in Artengruppen unterteilt, wobei das Vorhandensein oder Fehlen des Muskelmagens und die nach hinten verlagerten Prostataporen zur Unterteilung der Gruppen als ausschlaggebend betrachtet werden. Später stellt GATES (1962) für *Gordiodrilus robustus*, die einen kräftigen Muskelmagen im 8. Segment besitzt, die neue Gattung *Dorgiodrilus* auf. Im vorliegenden Material sind Arten mit und ohne Muskelmagen angetroffen worden.

Gordiodrilus zanzibaricus Beddard, 1894

Ob diese an verschiedenen Fundorten gesammelten Tiere, die mit der Originalbeschreibung im wesentlichen übereinstimmen, auch mit Sicherheit dieser Art angehören, bleibt fraglich, da von jedem Fundort nur ein Exemplar erbeutet, ein Variieren der Merkmale an Serien nicht verfolgt werden konnte.

Fundorte: I/3. AF/757 1+1 juv. Ex., II/1. AF/2982 1 Ex., V/5. AF/2984 1 Ex..

Gordiodrilus marcusi Righi, 1968

Es liegen 4 Exemplare von diesem Regenwurm vor, die auf Grund der unpaarigen Samentaschenporen auf Intersegmentalfurche 7/8 und 8/9 zu *marcusi* gestellt werden müssen. *G. marcusi* wurde in Brasilien, aus dem Staat Sao Paulo bei Anhembi beschrieben u. zw. an Hand von 403 Exemplaren. Seither wurde sie nicht wieder erwähnt. Ob es sich im ORSTOM Park von Brazzaville um eine Verschleppung aus Brasilien handelt, kann mit Sicherheit nicht behauptet werden, da der einzige Fundort in Südamerika mit 403 Exemplaren eventuell ebenfalls auf eine Verschleppung nach Brasilien aus Afrika hindeuten könnte. Dies auch schon deswegen, da die übrigen Arten dieser Gattung nur in Afrika gesammelt wurden.

Da meine Exemplare einige Abweichungen von der Originalbeschreibung aufweisen, gebe ich eine kurze Beschreibung meiner Tiere an.

Länge 32-33 mm, Dicke 0,9-1,1 mm, Segmentzahl 99-105.

Farbe unpigmentiert, weiss, Kopf prolobisch, Borsten zart, sehr eng gepaart. Gürtel ringförmig vom 14.-18., 1/2 19. Segment. Männliche Poren auf Intersegmentalfurche 18/19, dicht nebeneinander. Prostataporen paarig auf dem 18. und 19. Segment auf einem hervorstehenden ovalen Pubertätsfeld. In der Mitte dieses Pubertätsfeldes verläuft eine etwas gebogene Samenrinne (Abb. 1.).

Samentaschenporen unpaarig auf Intersegmentalfurche 7/8 und 8/9 in der ventralen Medianlinie. Weibliche Poren auf dem 14. Segment etwas seitlich gelegen.

Innere Organisation. Dissepimente 6/7-8/9 verdickt. Ein rudimentärer Muskelmagen im 6. Segment. Chylustaschen im 9. Segment. Grosse Intestinalherzen im 10. und 11. Segment. Hoden und Samentrichter im 10. und 11. Segment. Samensäcke im 9., 10. und 12. Segment. Mächtige traubenförmige Ovarien im 13. Segment. Mitteldarm im 14. Segment beginnend. Prostata im 18. und 19. Segment, kurzer muskulöser Ausführungsgang mit sehr langem gewundenen Drüsenteil, der vom 18. Segment nach vorne gerichtet bis ins 13. Segment und vom 19. Segment nach hinten gerichtet bis ins 27. Segment reicht. Samenleiter verlaufen bis ins 18./19. Segment und münden dicht nebeneinander zwischen den Prostata aus. Kopulationstaschen nicht vorhanden.

Samentaschen unpaarig, birnenförmige Ampulle mit kurzem Ausführungsgang, ohne Divertikel (Abb. 2-3.).

Gewisse Unterschiede sind also in der Lage des Gürtels, in der Zahl der Samensäcke und im Vorhandensein eines rudimentären Muskelmagens erkannt worden. Diese reichen jedoch nicht zur Aufstellung einer neuen Unterart aus.

Fundort: VI/1. AF/3214 2 Ex., 22112 INVE 1 Ex..

Gordiodrilus paski Stephenson, 1928

Mehrere Exemplare aus der Umgebung von Loudima zeigen in den meisten Kennzeichen eine Uebereinstimmung mit *G. paski*, die aus Ostafrika vom Tanganjikasee beschrieben wurde und zu der JAMIESON (1962 *a*, 1963 *b*) die Arten *G. unicus* Stephenson, 1931 aus Burma, *G. peguanus* Gates, 1942 aus Indien, Bangalore und *G. peguanus* part. (GATES 1954) aus Porto Rico eingezogen hat. Es handelt sich also um eine weitverbreitete Art, deren Vorkommen in einem landwirtschaftlich intensiv genutzten Gebiet verständlich erscheint. Besonders kennzeichnend sind bei dieser Art die angeschwollenen Ausführungsgänge der Samentaschen, die auch als Samenkämmerchen betrachtet werden können (Abb. 4.).

Fundorte: III/2. AF/863, 22113 INVE 10 Ex., III/3. AF/2965 1 Ex..

Dorgiodrilus Gates, 1962

Dorgiodrilus robustus (Beddard, 1892)

Diese mit einem kräftigen Muskelmagen im 8. Segment und mit Samentaschenöffnungen auf Intersegmentalfurche 6/7 und 7/8 beschriebene Art ist einwandfrei wiederzuerkennen. Obwohl meine Tiere vollkommen mit der Beschreibung von *G. robustus congicus* Michaelsen, 1936 übereinstimmen, schliesse ich mich den ausführlichen Neubeschreibungen von Jamieson (1963 *a*, *b*) an und betrachte die Unterart congicus ebenfalls als ein Synonym der Stammform.

Fundorte: III/1. AF/852 1 Ex., VI/1. AF/2981 1 Ex., VI/2. AF/2974 3 Ex., VI/6. AF/2967 2+5 juv. Ex., 22114 INVE 1+1 juv. Ex..

Xibaro Righi, 1981

Von den zur Bestimmung vorliegenden Tieren konnten unter den holoandrischen Formen Exemplare mit einem kräftigen Muskelmagen im 6. und 7. Segment und mit ein Paar Samentaschen im 9. Segment nachgewiesen werden. Da bisher nur meroandrische Formen mit einem Muskelmagen im 6. und 7. Segment aus Afrika beschrieben wurden (*Nematogenia*, *Temanonegia*), ist dies der erste Fundort solcher Taxa aus Westafrika. Da ich diesen Organen ebenfalls eine ausschlaggebende taxonomische Bedeutung zumesse, reihe ich meine beiden neuen Arten vorläufig in die von Righi (1981) aus Südamerika beschriebenen Gattung Xibaro ein.

Xibaro pauliani sp. n.

Länge des Holotypus 37 mm, Dicke 1,2 mm, Segmentzahl 109. Paratypen: Länge 30 - 45 mm, Dicke 1,2 -1,4 mm, Segmentzahl 101 - 121.

Farbe weiss, unpigmentiert. Kopf eingezogen, prolobisch. Vordere Segmente nicht doppelt geringelt. Borsten zart, eng gepaart, Borstenverhältnis hinter dem Gürtel *aa* : *ab* : *bc* : *cd* : *dd* wie 10 : 1,2 : 5 : 1 : 40. Rückenporen fehlen. Weibliche Poren auf dem l4. Segtment, vor der Borstenlinie *ab*.

Gürtel vom 1/2 13., 13. - 1/2 21., 21. Segment, beinahe ringförmig, nur in Höhe des Pubertätsfeldes offen (Abb. 5.). Prostataporen auf dem 17. und 19. Segment, die des 17. Segmentes gross, auf hervorstehenden Papillen, sind mit den männlichen Poren verschmolzen. Prostataporen des 19. Segmentes klein, manchmal geschlossen.

Innere Organisation. Dissepimente 6/7 - 9/10 sehr stark verdickt. Muskelmagen im 6. und 7. Segment, sehr kräftig und muskulös. Chylustaschen im 9. Segment, gross, mit kurzem Stiel, im inneren mit lamellenartiger Struktur. Hoden und Samentrichter im 10. und 11. Segment, frei. Samensäcke als freie Samenmassen im 11. und 12. Segment. Ovarien im 13. Segment, Ovarientrichter auf dem 13./14. Dissepiment, Eileiter öffnen sich im 14. Segment. Prostata des 17. Segmentes mit kurzem muskulösen Ausführungsgang und langem drüsigen Teil, der auch bis ins 33.-35. Segment reichen kann oder stark gewunden ist. Prostata des 19. Segmentes mit kurzem Ausführungsgang und sehr kleinem drüsigen Teil, der auch auf das 19. Segment beschränkt ist. Samenleiter münden hinter der Prostata des 17. Segmentes aus. Keine Kopulationstaschen vorhanden. Mitteldarm im 13. Segment beginnend, Typhlosolis fehlt.

Samentaschen im 9. Segment, Ampulle fingerförmig, prall mit Samenmassen gefüllt, Ausführungsgang gewunden, ohne Divertikel (Abb. 6.).

Die neue Art unterscheidet sich von *X. ashmoli* Righi, 1981 durch das Fehlen der Samenrinne zwischen den Prostataporen des 17. und 19. Segmentes, durch die Lage der männlichen Poren und dadurch, dass sie nur ein Paar Samentaschen im 9. Segment besitzt.

Bemerkung: Bei *X. pauliani* sp. n. ist eine microscolecine Reduktion im Gange, wobei die Samentaschen des 8. Segmentes vollkommen verschwunden, die Prostataporen des 19. Segmentes sehr klein und manchmal geschlossen, die Samenrinne zwischen den Prostataporen des 17. und 19. Segmentes ebenfalls geschwunden sind. Im Inneren sind die Prostatadrüsen des 19. Segmentes im Gegensatz zu denen des 17. Segmentes sehr kurz und verkümmert.

Die neue Art wird zu Ehren Herrn Prof. Dr. R.M.A. Paulian benannt, dem damaligen Direktor des ORSTOM Institutes, Brazzaville, der unsere Sammeltätigkeit weitgehend förderte.

Fundorte: HOLOTYPUS. VII. AF/3201 Volksrepublik Kongo, Mayombe, Station Dimonika, 1984, leg. P. Lavelle. - PARATYPEN. AF/3200 10 +1 juv. Ex., 22115 INVE 1 Ex., Fundort wie beim Holotypus.

Xibaro lavellei sp. n.

Länge des Holotypus 34 mm, Dicke 1,5 mm, Segmentzahl 108. Paratypen: Länge 32 - 37 mm, Durchmesser 1,3-1,7 mm, Segmentzahl 103-118.

Farbe grau, unpigmentiert, Kopf eingezogen, prolobisch. Segmente am Vorderkörper mehrfach geringelt. Borsten zart, sehr eng gepaart. Borstendistanz hinter dem Gürtel *aa* : *ab* : *bc* : *cd* : *dd* wie 7 : 1,1 : 6,5 : 0,9 : 35 Rückenporen fehlen.

Gürtel sattelförmig vom 14. - 18., 1/2 19., 19. Segment. Weibliche Poren auf dem 14. Segment in der Borstenlinie *ab*. Prostataporen auf dem 17. Segment, zusammen mit den männlichen Poren auf einer kreisrunden Papille (Abb. 7.).

Samentaschenporen auf Intersegmentalfurche 8/9 in der Borstenlinie ab.

Innere Organisation. Dissepimente 5/6 - 8/9 stark verdickt, 9/10 - 11/12 dünn, aber deutlich. Schlunddrüsen bis ins 6. Segment reichend. Muskelmagen im 6. und 7. Segment, kräftig muskulös. Chylustaschen im 9. Segment, mächtige seitliche Gebilde am Oesophagus, die durch einen gedrungenen Stiel angeheftet sind. Hoden und Samentrichter im 10. und 11. Segment, frei. Samensäcke im 11. und 12. Segment. Ovarien im 13. Segment, gross, Ovarientrichter auf Dissepiment 13/14, Eileiter im 14. Segment, münden in Höhe der Borstenlinie *ab* aus. Prostata im 17. Segment, lange drüsige Gewinde, die durch einen kurzen Ausführungsgang ohne Kopulationstasche ausmünden. Penialborsten nicht vorhanden. Exkretionssystem meganephridisch, Nephridialblase vorhanden. Mitteldarm im 13. Segment, ohne Typhlosolis.

Samentasche im 9. Segment, mit mehrfach gewundener Ampulle und kurzem Ausführungsgang, der ebenfalls mit Samenmassen gefüllt ist (Abb. 8.). Die neue Art steht *Nannodrilus africanus* Beddard, 1894 am nächsten, unterscheidet sich von ihr durch die Lage des Muskelmagens, durch die paarige Chylustasche, durch das Fehlen der Kopulationstasche und dadurch, dass die neue Art nur ein Paar Prostata besitzt.

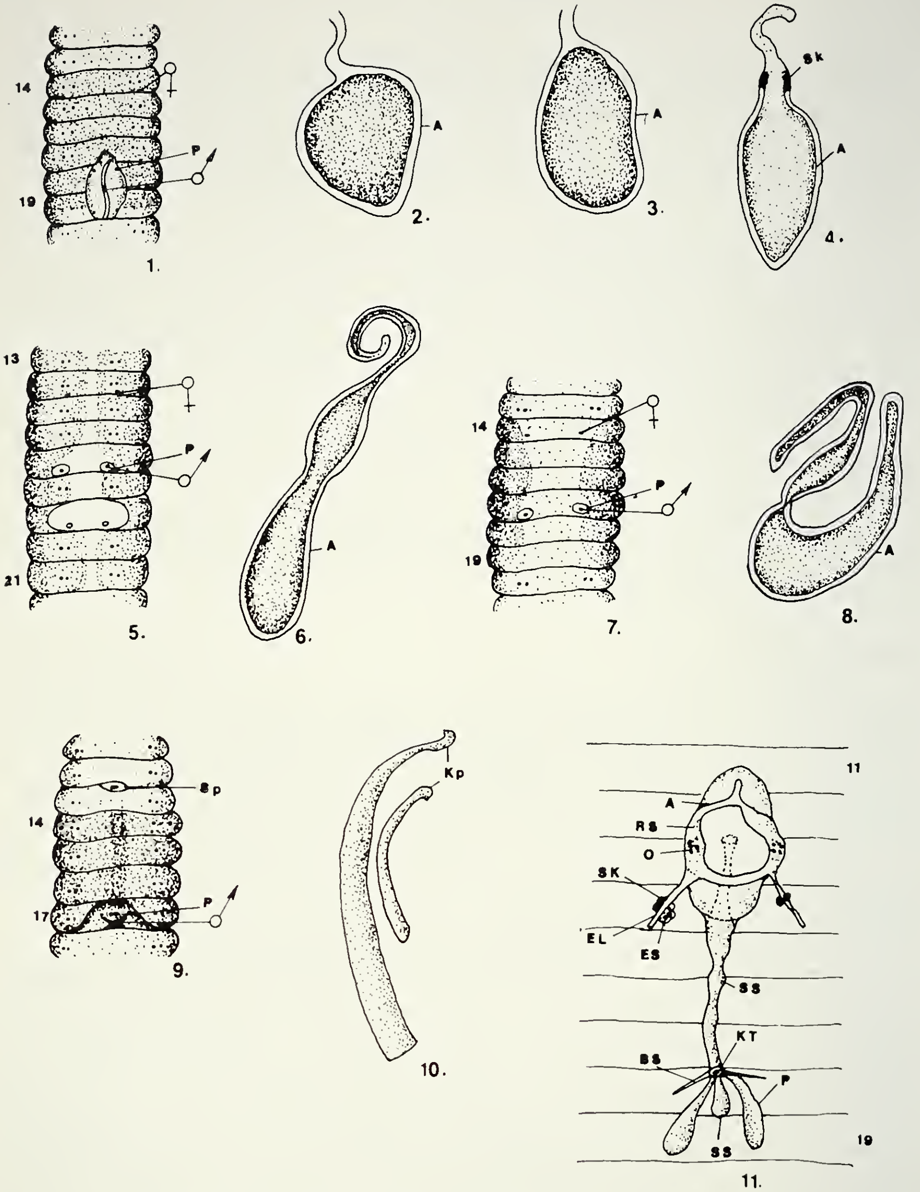

ABB. 1-11 *Gordiodrilus marcusi* Righi, 1968. 1. Ventralansicht der Gürtelorgane. P = Prostataporen. 2-3. Samentasche des 8. und 9. Segmentes. A = Ampulle. Abb. 4 *Gordiodrilus paski* Stephenson, 1928. Samentasche des 8. Segmentes. 5-6 *Xibaro pauliani* sp. n. 5. Ventralansicht der Gürtelorgane. P = Prostataporen. 6. Samentasche des 8. Segmentes. A = Ampulle. 7-8 *Xibaro lavellei* sp. n. 7. Ventralansicht der Gürtelorgane. P = Prostataporen. 8. Samentasche des 9. Segmentes. 9-11 *Chuniodrilus congoensis* sp. n. 9. Ventralansicht der Gürtelorgane. Sp = Samentaschenporen, P = Prostataporen. 10. Penialborsten. Kp = Kopf der Penialborsten. 11. Weiblicher Geschlechtsapparat. A = Ampulle, RS = Ringschlauch, O = Ovarien, SK = Samenkämmerchen, EL = Eileiter, ES = Eiersack, SS = Samentaschenschlauch, BS = Borstensack, KT = Kopulationstasche, P = Prostata.

Bemerkung: Im Gegensatz zur vorausgehend beschriebenen *X. pauliani* sp. n. ist hier eine vollständige microscolecine Reduktion des Geschlechtsapparates eingetreten.

Die neue Art wird Herrn Prof. P. Lavelle, Paris, dem Sammler dieses Materials, zu Ehren benannt.

Fundort: HOLOTYPUS.VII. AF/3198 Volksrepublik Kongo, Mayombe, Station Dimonika, 1984, leg. P. Lavelle. - PARATYPEN. AF/3199 5+3 juv. Ex., 22116 INVE 1 Ex., Fundort wie beim Holotypus.

Ocnerodrilus Eisen, 1878

Ocnerodrilus occidentalis Eisen, 1900

Fundorte: I/1. AF/746 2 Ex., AF/3219 2 Ex., I/2. AF/3241 7 Ex., I/4. 3215 13 Ex., II/1. AF/818 1 Ex., AF/2975 7 Ex., AF/2977 1 Ex., AF/2983 3 Ex., II/4. AF/3218 5 Ex., II/5. AF/3220 1 Ex.,V/1. 3216 3 Ex..

Nematogenia Eisen, 1900

Nematogenia lacuum (Beddard, 1893)

Fundorte: II/1. AF/2963 1 Ex., AF/2976 1 Ex., AF/2978 1 Ex., II/5. AF/3220 1 Ex..

Nematogenia panamaensis (Eisen, 1900)

Fundorte: I/1. 745 1 Ex., AF/2979 1 juv. Ex., AF/2971 6 Ex., I/4. AF/2966 7 Ex., AF/3016 6+12 juv. Ex., II/1. AF/2962 6 Ex., II/4. AF/825 3 Ex., AF/2969 5 Ex., II/5. AF/836 2 Ex., AF/839 1Ex., III/1. AF/2980 1 Ex., III/2. AF/2964 2 Ex., IV/2. AF/893 1 Ex., VI/1. AF/2968 2 Ex., VII. AF/2958 3 Ex., AF/2960 3 Ex..

EUDRILIDAE Claus, 1880

Pareudrilinae Beddard, 1894

Chuniodrilus Michaelsen, 1913

Dieser von Michaelsen aufgestellten monotypischen Gattung (*C. schomburgki* Michaelsen, 1913) wurden später weitere Arten (*zielae, compositus* Omodeo, 1958, , *vuattouxi* Wasawo & Omodeo, 1963, *palustris* Omodeo & Vaillaud, 1967, *fragilis* Sims, 1967, *ghabbouri* Jamieson, 1969) eingereiht. Diese holoandrische Gattung wurde von den anderen Gattungen der Unterfamilie Pareudrilinae durch den unpaarigen Samentaschenporus auf Intersegmentalfurche 12/13, durch das Vorhandensein eines Muskelmagens im 5. Segment und durch mehrere intestinale Muskelmagen unterschieden. In seiner Revision der zentralafrikanischen Regenwurmfamilie Eudrilidae behält SIMS (1987) in dieser Gattung nur die Arten, die über diese Kennzeichen verfügen, alle anderen werden zur Gattung *Stuhlmannia* Michaelsen, 1900 (zielae, vuattouxi, palustris, fragilis, ghabbouri) bzw. zu *Libyodrilus* Beddard, 1891 (compositus) gestellt. Bis auf die Art *vuattouxi* stimme ich mit der Revision von SIMS überein, da sie aber über intestinale Muskelmagen im 21. und. 22. Segment verfügt, reihe ich sie, trotz der auf Intersegmentalfurche 13/14 liegenden Samentaschenporen, in die Gattung *Chuniodrilus* ein.

Im vorliegenden Material sind an verschiedenen Orten mehrere Exemplare angetroffen worden, die von *C. schomburgki* in mehreren Kennzeichen abweichen und nachstehend als neue Art beschrieben werden.

Chuniodrilus congoensis sp. n.

Länge des Holotypus 40 mm, Dicke 1 mm, Segmentzahl 112. Paratypen: Länge 15 - 48 mm, Durchmesser 0,7 - 1,2 mm, Segmentzahl 87 - 110 mm.

Farbe grau, pigmentlos. Kopf prolobisch.Vordere Segmente ungeringelt. Borsten am ganzen Körper sehr eng gepaart. Borstenverhältnis hinter dem Gürtel *aa*: *ab*: *bc*: *cd*: *dd* wie 7: 1,2: 8: 1: 40. Rückenporen von Intersegmentalfurche 4/5 beginnend deutlich zu erkennen. Nephridialporen in der Borstenlinie *cd*.

Gürtel vom 14. - 16.,1/2 17. Segment, ringförmig. Weibliche Poren auf dem 14. Segment, neben der Borstenlinie *b*. Samentaschenporen unpaarig auf Intersegmentalfurche 12/13, kleiner Schlitz, der von einem ovalen Hof umgeben wird. Prostataporen unpaarig, münden mit den männlichen Poren gemeinsam auf Intersegmentalfurche 17/18 aus (Abb. 9.).

Innere Organisation. Dissepimente 5/6 - 8/9 etwas stärker, 9/10 - 10/11 weniger stark verdickt. Ein kräftiger Muskelmagen im 5. Segment, Speicheldrüsen reichen bis ins 5. Segment. Intestinale Muskelmagen im 16.-18. Segment, besonders deutlich im 18. Segment zu erkennen. Herzen im 10. und 11. Segment. Hoden und Samentrichter im 10. und 11. Segment, von mächtigen aufgefransten Testikelblasen umgeben. Prostata im 17. Segment, muskulös und bei den einzelnen Tieren verschieden lang nach hinten reichend. Prostata münden gemeinsam in eine Kopulationstasche aus. Vor jeder Prostata mündet auch ein Penialborstensack durch die Kopulationstasche aus. Jeder Penialborstensack enthält 2 Penialborsten. Die eine Borste ist immer grösser als die andere, grosse Borste 980μ lang und 70μ breit, kleine Borste 560μ lang und 30μ breit. Borsten am Ende etwas angeschwollen und zugespitzt (Abb. 10.).

Weiblicher Geschlechtsapparat. Der unpaarige ventralmediane Samentaschenporus mündet in ein grosses Samentaschen-Atrium mit sehr dicker muskulöser Wandung ein. Dieses Atrium ist auf der Ventralseite auch von aussen zu erkennen und reicht vorne bis ins 1/2 11. Segment, nach hinten bis ins 1/2 14. Segment. Samentaschen-Atrium setzt sich in einem Schlauch fort, der stark gewunden bis ins 18. Segment reicht. Aus dem vorderen Teil der Atriums geht in der Mitte ein dünner Schlauch hervor, der sich kurz nachher teilt und einen Ringschlauch um das Atrium bildet.

Beiderseits schliessen sich diesem in Höhe des 12/13 Dissepiments die Ovarialblasen mit den Ovarien an. Aus den Ovarienblasen gehen beiderseits durch einen Verbindungsschlauch die Eileiter hervor, die proximal verengt und eingerollt sind. Diesen gegenüber liegt ein grosser Eiersack, der in das 14. Segment hängt. Der Eiersack besitzt ein traubenförmiges Aussehen. Ein kleines Samenkämmerchen steht vor dem Eitrichter und ist mit dem Schlauch der Samentasche in Verbindung. Die rechte Seite ist bei den meisten Exemplaren verkümmert, hier ist der Eileiter und ein ganz kleiner Eiersack zu erkennen, oder der letztere fehlt gänzlich. Beiderseits treten die Eileiter im 14. Segment aus (Abb. 11.).

Die neue Art steht *C. schomburgki* am nächsten, unterscheidet sich von dieser durch die Zahl und Form der Penialborsten und in der Ausbildung des weiblichen Geschlechtsapparates.

Bemerkung: Einige Exemplare unterscheiden sich wesentlich von der vorausgehenden Beschreibung, da ihnen die Prostata einer Seite oder beiderseitig fehlen, die intestinalen Muskelmagen nur undeutlich muskulös ausgebildet sind oder nur der im 18. Segment muskulös ist. Auch in der Ausbildung des weiblichen Geschlechtsapparates sind Reduktionsvorgänge zu beobachten, auf die in der Beschreibung schon hingewiesen wurde.

Fundorte: HOLOTYPUS. II/4. AF/3222 Sibiti, Ufer des Zanzi-Flusses, Galeriewald, 28. XI. 1963 leg. Zicsi. - PARATYPEN. AF/3211 21 Ex., 22117 INVE 2 Ex., Fundort wie beim Holotypus - I/4. AF/3017 2 Ex., Meya, Bangu Regenwald, 9. XI. 1963 leg. Zicsi - II/5. AF/835 1 Ex., Sibiti, Bouenza Wasserfall, Regenwald, 30. XI. 1963 leg Zicsi - III/1. AF/3223 1 Ex., Loudima, Obstplantage, 5. XII. 1963 leg. Zicsi - V/1. AF/914 1 Ex., AF/3217 1 Ex., Reservat Lefini, 5-14. I. 1964 leg. Zicsi - VI/8. AF/906 10 Ex., 30 km westlich von Brazzaville, Forêt Classée, Regenwald, 26. XII. 1963 leg. Zicsi.

Stuhlmannia Michaelsen, 1890

Stuhlmannia variabilis variabilis Michaelsen, 1890

Fundorte: I/1. AF/748 1 Ex., I/3. AF/760 2 Ex., II/1. AF/794 1 Ex., AF/845 4 Ex..

Eudrilinae Claus, 1880

Eminoscolex Michaelsen, 1896

Eminoscolex seidlae Zicsi & Csuzdi, 1986

Fundorte: I/3. AF/762 1 Ex., AF/2989 1 Ex., VII. AF/2985 3+1 juv. Ex..

Eminoscolex baloghi Zicsi & Csuzdi, 1986

Fundorte: I/3. AF/761 1 Ex., I/4. AF/775 3Ex..

Eminoscolex kisantuanus Michaelsen, 1935

Fundorte: VII. AF/3002 3 Ex., AF/3011 1 Ex..

Hyperiodrilus Beddard, 1890

Hyperiodrilus africanus Beddard, 1891

Fundort: VII. AF/3010 4 Ex..

Eudrilus Perrier, 1871

Eudrilus eugeniae (Kinberg, 1867)

Fundort: VII. AF/3009 2 Ex..

Buettneriodrilus Michaelsen, 1897

Buettneriodrilus sulcatus Zicsi & Csuzdi, 1986

Fundort: VII. AF/3008 6 Ex..

Euscolex Michaelsen, 1903

Euscolex angolanus Michaelsen, 1937

Fundort: II/5. AF/834 1 Ex..

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Phylogenetic relationships between Hypostominae and Ancistrinae (Siluroidei: Loricariidae): first results from mitochondrial 12S and 16S rRNA gene sequences[1]

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Phylogenetic relationships between Hypostominae and Ancistrinae (Siluroidei: Loricariidae): first results from mitochondrial 12S and 16S rRNA gene sequences. - Partial 12S and 16S mitochondrial rRNA gene sequences were obtained from 16 species of South American catfishes belonging to the subfamilies Hypostominae, Ancistrinae, and Loricariinae sensu Isbrücker (Siluroidei: Loricariidae). The analysis of these sequences indicates that within the clade of Hypostominae + Ancistrinae, Chaetostoma + Ancistrus form the sister group of all other analysed ancistrines and hypostomines. The Ancistrinae as presently defined, include all analysed Hypostominae and therefore are paraphyletic. The monophyly of *Ancistrus*, including the recently described *A. ranunculus*, is strongly supported.

Key-words: Catfish - Ancistrinae - Hypostominae - Molecular phylogeny - Mitochondrial rRNA genes.

INTRODUCTION

According to the most recent classification the catfish family Loricariidae includes more than 600 species grouped in 70 genera and 6 subfamilies: the Lithogeneinae, the Neoplecostominae, the Hypostominae, the Ancistrinae, the Hypoptopomatinae, and the Loricariinae (Isbrücker 1980). Loricariids are externally characterised by a sucker-like mouth located ventrally and by bony plates or scutes covering the body. The family is representative of the dramatic diversity of many teleost groups in Neotropical freshwaters (Schaefer 1986). New species, often placed in new genera, are regularly described (e.g. Isbrücker & Nijssen 1989; Reis *et al.* 1990; Weber 1991; Reis & Schaefer 1992; Muller & Isbrücker 1993). The systematics of the Loricariidae are still incompletely resolved.

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One of the major taxonomic problems concerns the phylogenetic relationships and the taxonomic status of two groups of species presently referred to the Ancistrinae and Hypostominae. Long considered as the single taxon Hypostominae (formerly Plecostominae) (EIGENMANN & EIGENMANN 1890; REGAN 1904; GOSLINE 1948), the two subfamilies were recognised by ISBRÜCKER (1980) who based his decision on a character shared by all Ancistrinae: the presence of evertible interopercular odontodes. This character was already used by KNER (1853, 1854) for the distinction of two subgroups, and also by GOSLINE (1947) who stated, however, that the two subgroups were not totally discontinuous. In a study mostly based on cranial myology, HOWES (1983) considers the Ancistrinae as polyphyletic and places their representatives within the Hypostominae and the Chaetostominae (fig. 1A). However, in the last and the most extensive phylogenetic analysis of loricariid subfamilies, SCHAEFER (1986, 1987) found uniquely derived osteological characters supporting the group Hypostominae + Ancistrinae as well as the monophyly of the Ancistrinae but found no evidence suggesting the monophyly of the Hypostominae (fig. 1B). This author also recognised the Loricariinae as the monophyletic sister group of Ancistrinae plus Hypostominae.

The present study is a first attempt to resolve the phylogenetic relationships between Hypostominae and Ancistrinae species using molecular data. In comparison with morphological techniques, molecular methods have the great advantage of avoiding the problems of phenotypic variabilities (AVISE *et al.* 1987). The high rate of mutational changes and the matrilineal mode of inheritance make mitochondrial DNA a particularly appropriate and powerful tool for this kind of investigations (MORITZ *et al.* 1987; MEYER 1993). HILLIS & DIXON (1991) suggested that mitochondrial rRNA genes are especially useful for investigating relationships among groups that diverged less than 65 million years ago. The paleontological data allow no conclusions about loricariids evolution since the scarce fossil records of this group belong to the Miocene and are very close to modern species (ARRATIA & CIONE 1996, LUNDBERG 1996). The mitochondrial rRNA genes were used for inferring the phylogeny of some antarctic Notothenioidei (BARGELLONI *et al.* 1994), the phylogeny of Gymnotoidei (ALVES-GOMES *et al.* 1995) as well as the one of piranhas and Characiformes (ORTI *et al.* 1996, ORTI & MEYER 1997).

Here we present phylogenetic relationships of 10 species of Ancistrinae, four species of Hypostominae and two species of Loricariinae, based on partial 12S and 16S mitochondrial rRNA gene sequences.

MATERIAL AND METHODS

FISH SPECIMENS AND DNA SEQUENCING

Sixteen specimens were used in this study: 10 specimens of Ancistrinae representing six genera, four specimens of Hypostominae representing three genera and two specimens of Loricariinae representing two genera. The specimens are deposited in the Natural History Museum of Geneva (MHNG). Species, origins, museum collection numbers (MHNG) and EMBL/GenBank accession numbers are given in Appendix 1.

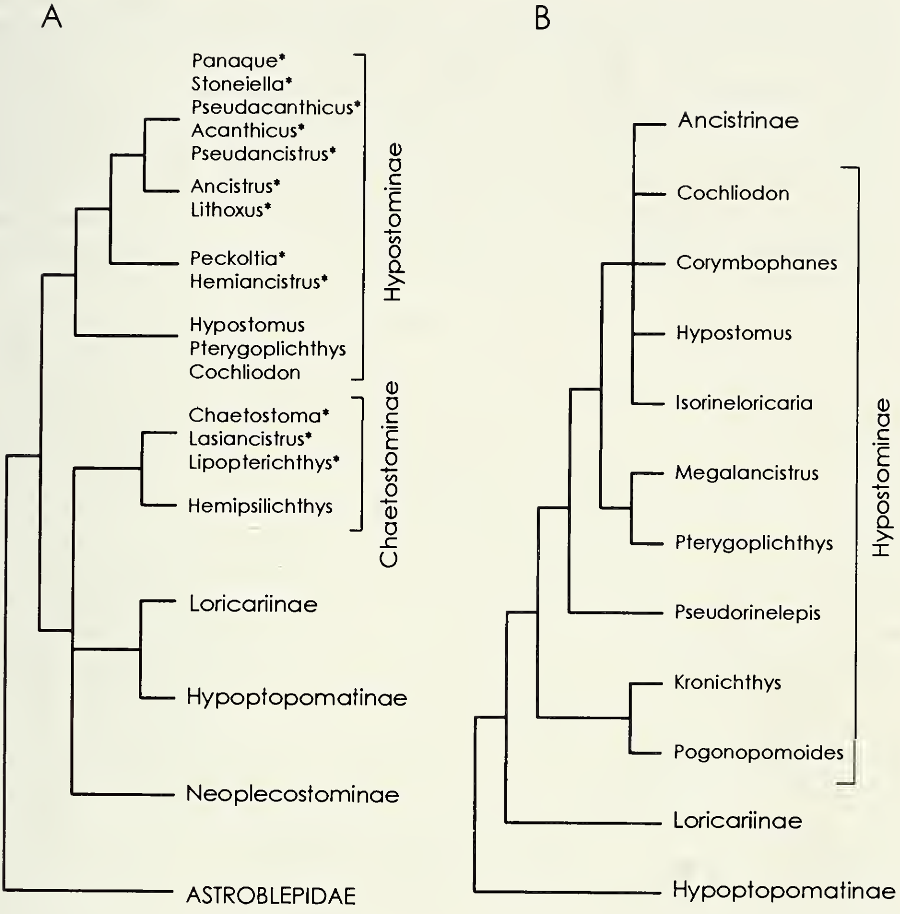

FIG. 1

Previous hypotheses of phylogenetic relationships of present Ancistrinae and Hypostominae species. A: HOWES (1983) hypothesis based on myological and osteological characters. Genera included in the Ancistrinae *sensu* SCHAEFER are indicated with an asterisk. B: SCHAEFER (1986, 1987) hypothesis based on osteological characters.

Total DNA was extracted from fresh, frozen or ethanol preserved muscle tissue samples using a rapid one-step extraction method (STEINER *et al.* 1995) or the standard DNA extraction protocol, using SDS-based extraction buffer and Proteinase K digestion (KOCHER *et al.* 1989; ALVES-GOMES *et al.* 1995).

Partial 12S rRNA and 16S rRNA mitochondrial genes were amplified by the polymerase chain reaction (PCR) with the following primers: L1091 and H1478 for the 12S gene, L2510 and H3059 for the 16S gene (as given by ALVES-GOMES *et al.*

1995). The amplifications were performed in a total volume of 50 γ during 40 cycles with the following profile: 30s at 93,5° C, 30s at 50° C (for the 16S fragment) or 65° C (for the 12S fragment), and 120s at 72° C, followed by 5 min at 72° C for final extension. The PCR products were purified using a Spin-Bind extraction unit (FMC). The purified PCR products were sequenced directly with the *fmol* DNA Sequencing System (Promega), according to the manufacturer's instructions. In order to test the efficiency of the direct sequencing, the purified PCR products of some species were ligated into the pGEM-T Vector System (Promega) and cloned in Supercompetent XL2-Blue cells (Stratagene) prior to sequencing.

SEQUENCE ALIGNMENT AND PHYLOGENETIC ANALYSES

The sequences of partial 12S and 16S mitochondrial rRNA genes were assembled in order to form a unique sequence (783-790 nucleotides) and were manually aligned using the Genetic Data Environment software, version 2.2 (LARSEN *et al.* 1993). We also included in the alignment a sequence of *Hypostomus* sp. (ALVES-GOMES *et al.* 1995, GenBank accession number U15263 and U15239 for the 12S and 16S respectively). For inferring the phylogenetic trees, we used as outgroup the sequences of two Loricariinae species, *Loricaria* cf. *simillima* and *Rineloricaria* sp., but also an existing sequence of *Corydoras* sp. (ALVES-GOMES *et al.* 1995, GenBank accession number U15271 and U15247 for the 12S and 16S respectively), which is a representative of the Callichthyidae, closely related to Loricariidae (SCHAEFER 1990).

Trees were built using three different methods: 1) the neighbor-joining (NJ) method (SAITOU & NEI 1987) applied to distances corrected for multiple hits and for unequal transition and transversion rates following Kimura's 2-parameter model (KIMURA 1980) and Tajima and Nei method (TAJIMA & NEI 1984); 2) the maximum parsimony (MP) method, using heuristic search option and 10 replicates for random stepwise addition of taxa, included in PAUP 3.1.1 (SWOFFORD 1993); and 3) the maximum likelihood (ML) method as implemented in fastDNAml programme (OLSEN *et al.* 1994). The reliability of internal branches of the trees was assessed using the bootstrap method (FELSENSTEIN 1988); 1000, 500 and 200 bootstrap replications were performed for the NJ, MP and ML methods respectively. The Phylo-win programme (N. GALTIER & M. GOUY, unpublished) was used for distance computations, NJ and ML trees building and bootstrapping. Phylogenetic trees were plotted using Njplot programme (M. GOUY, unpublished). The KISHINO & HASEGAWA (1989) test implemented in the Dnaml programme of Phylip (version 3.5, FELSENSTEIN 1993) was used to compare our molecular tree with the competing morphological hypotheses.

RESULTS

SEQUENCE ANALYSIS

The position of the mitochondrial rRNA genes and of the amplified fragments is shown in figure 2. The amplified fragment of the 12S rRNA is about 435 base pairs (bp) long and corresponds to the position 419 to 854 starting from the 5' end of the carp mitochondrial 12S rRNA gene (CHANG *et al.* 1994). The 16S amplified fragment is about 623 bp long and corresponds to the position 898 to 1521 from the 5' end of the carp 16S rRNA gene. The sequenced fragment of the 12S rRNA was 314 to 316 bp long depending on the taxon, whereas for the 16S rRNA the sequenced fragment was 469 to 474 bp long. The sequenced 12S fragment comprises 12 complete helices (31, 33-36, 38-42, 45, 47) and 4 partial helices (2', 22', 32, 48) according to the secondary structure and to the helix numbering of the carp mitochondrial 12S rRNA gene proposed by VAN DE PEER *et al.* (1994). The 16S fragment comprises 15 complete helices (E26-E28, F1, G2-G3, G6-G10, G13-G16) and 8 partial helices (E1', E18', E21', E24', E25', G1, G17, G18) following the secondary structure and the helix numbering of the carp mitochondrial 16S rRNA gene suggested by DE RIJK *et al.* (1994).

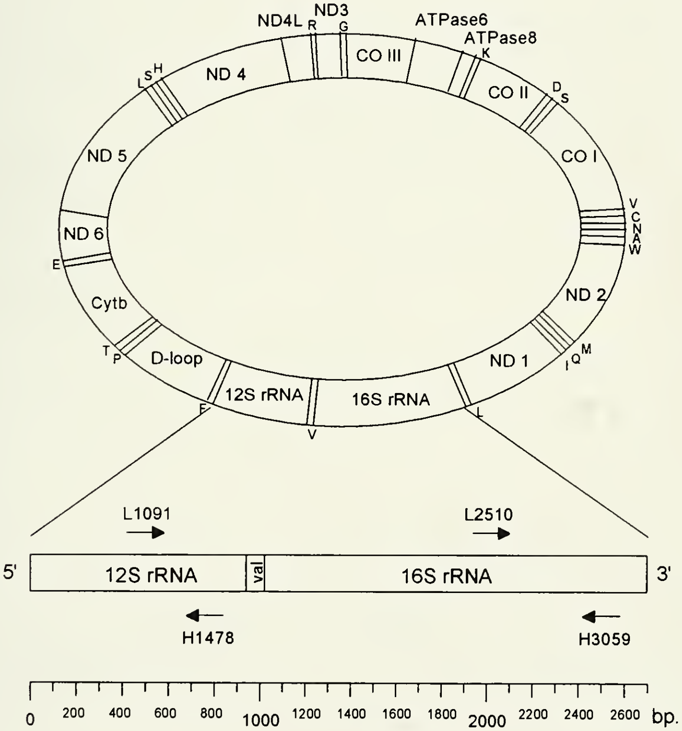

FIG. 2

General organization of the genes in fish mitochondrial DNA (CHANG *et al.* 1994; ZARDOYA *et al.* 1995). The tRNA genes are given by the one-letter amino acid code. Enlarged are the two rRNA genes and the position of the primers we used.

A total of 315 and 466 sites were aligned in the 12S and 16S genes respectively. Seven sites located within the 16S rRNA could not be aligned unambiguously and were discarded from further analysis. The two partial rRNA gene sequences were joined together and analysed as a single sequence. Invariant positions represented 77.5% of the 12S fragment and 74.7% of the 16S fragment. From 68 informative sites in the ingroup (Ancistrinae + Hypostominae), 34 were located in each of the fragments. In the ingroup, the mean proportion of transitions (TS) for all pairwise comparisons is 4.51% of total sites in the 12S and 2.94% in the 16S fragment whereas for transversions (TV) these values are 0.76% of total sites in the 12S and 0.69% in the 16S. In the combined data set, sequence divergence among species within a genus ranged from 0.3% to 3.5%, whereas the genera of the ingroup showed sequence divergences ranged from 0.9% to 7.3%. In the combined dataset, the TS/TV ratio plotted against sequence divergences for all pairwise comparisons (fig. 3) increases from a mean value of 3.2 for divergences between 0.5% and 1.5% to a mean value of 8 for divergences between 3.5% and 4.5%. As the divergence among taxa increases, the TS/TV ratio declines and stabilises around 1.6 for divergences between 10% and 13%. The tendency for the accumulation of TS in recently diverged taxa has been observed in mt rRNA genes of fishes and other vertebrates (e.g. HIXSON & BROWN 1986; MINDELL & HONEYCUTT 1990; ALVES-GOMES *et al.* 1995).

In our data, 49.4% and 50.6% of all sites of the 12S are located in stems and loops respectively, whereas in the 16S, these values are 39.5% and 60.5% respec-

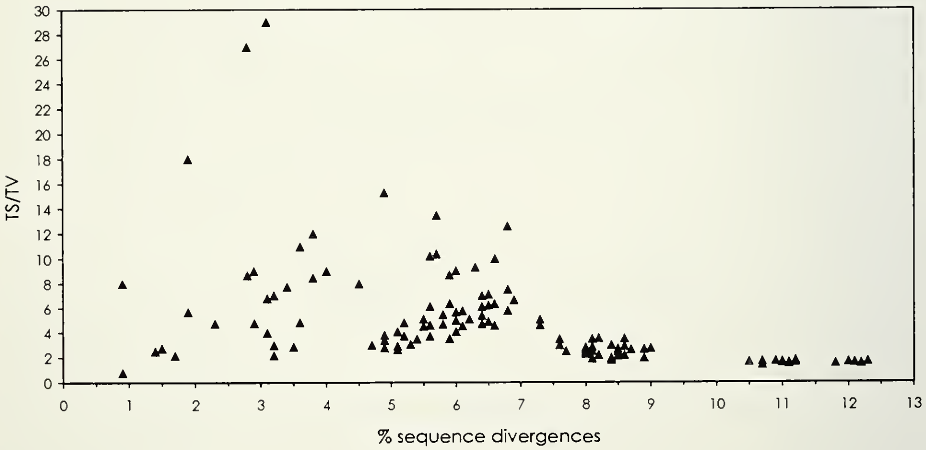

FIG. 3

Transition (TS) / Transversion (TV) ratio plotted against % sequence divergences for all pairwise comparisons of taxa.

tively. The sites located in loops are 1.68 and 2.96 times more variable than the ones in stems in the 12S and 16S respectively. Moreover, almost all transversion events occured in unpaired regions (80% and 92% of the sites showing transversions were located in loops in the 12S and 16S respectively).

Base composition showed no important differences among all examined taxa. Mean GC content in the 12S and 16S rRNA is about 49.9% and 46.5% respectively. In stems, mean GC content is about 59% in both segments whereas in loops this value is 41% in the 12S and 38% in the 16S. The low GC content found in loops may be a consequence of an overrepresentation of adenosine nucleotides (41.7% and 42.3% of all four nucleotides for the 12S and 16S respectively). The base composition bias between stems and loops observed in this study is congruent with those observed in mitochondrial rRNA genes of other fishes (ORTI *et al.* 1996).

PHYLOGENETIC RECONSTRUCTIONS

The phylogenetic trees inferred using the NJ, MP, and ML methods have the same topology (fig. 4). The well supported clade of Ancistrinae + Hypostominae forms the sister group of the Loricariinae. Within the group of Ancistrinae + Hypostominae two main clades are present (A and B, fig 4). Clade A consists of *Chaetostoma* aff. *fischeri* and five species of *Ancistrus*. Its monophyly is strongly supported (97% for the NJ and MP trees and 94% for the ML tree). The branching order within the genus *Ancistrus* also appears robust: *ranunculus* diverging first followed by *pirareta* and *dolichopterus*. *Ancistrus cirrhosus* and *multispinis* are sister taxa and have probably diverged recently (only three substitutions in the combined data set separate the two).

Clade B (fig. 4) includes the four other ancistrine species and all hypostomine species. However, the position of *Pseudacanthicus spinosus* in this clade is not well supported (low bootstrap values). In one of the MP trees obtained (when transversions were counted twice as much as transitions) this species was placed at the root of clade A, but with a very low bootstrap value (37%). The remainder ancistrines of clade B and all of the hypostomines analysed here group together in a well supported clade (clade C, fig. 4). The branching order of the different genera in this clade is not well supported. *Hypostomus affinis* and *H.* cf. *punctatus* cluster together. The third (*Hypostomus* sp., ALVES-GOMES *et al.* 1995) branches with *Glyptoperichthys joselimaianus*. The identification of this *Hypostomus* may be questionable.

We have tested several parameters to examine the robustness of the tree presented in figure 4. The ML method gave a tree of ln(L)= -2809.186 using a transition/transversion ratio of 2.0. Increasing the TS/TV ratio to 5.0, as suggested by the above analysis of sequences, does not change the topology. When all characters were uniformly weighted using the MP method, a single shortest tree was found of length=325 (CI = 0,56 excluding uninformative characters) the topology of which is identical to the NJ and ML trees. When transversions were counted twice as much as transitions, two shortest trees were found (length=380): the first has the same topology as the previous one, the second differs from the general tree only in the

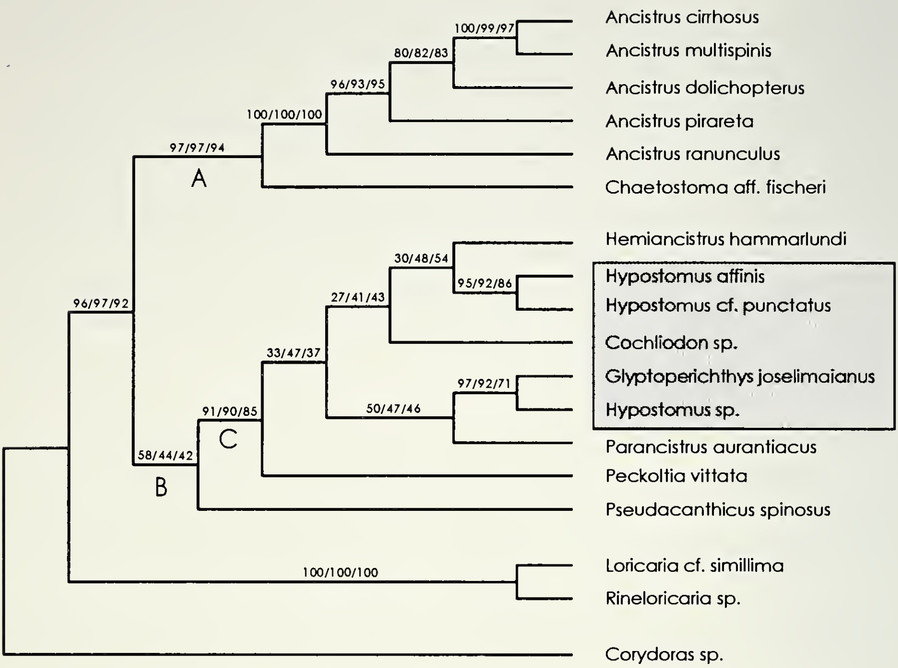

Fig. 4

Maximum parsimony unweighted phylogenetic tree (lengh = 325, CI = 0,56 excluding uninformative characters). Neighbor-joining and maximum likelihood methods gave the same topology. Numbers above each branch represent bootstrap values for neighbor-joining / maximum parsimony / maximum likelihood respectively. A, B, and C are the names of the clades (see text). The shadowed box presents the Hypostominae species analysed in this study.

position of *Pseudacanthicus spinosus* which is shown as the basal genus of the A clade (fig. 4). In order to check if any topological artefact was due to the overrepresentation of the genus *Ancistrus*, we discarded all but one of its species and tested with the NJ and ML methods. The general topology was conserved in both cases.

The KISHINO & HASEGAWA (1989) test showed that the proposal of HOWES (1983) as well as of SCHAEFER (1986, 1987) have a significantly lower log-likelihood than our molecular hypothesis, i.e. less significant (Δl = 43.14 ± 20.78 and Δl = 51.42 ± 24.35 respectively).

DISCUSSION

Our preliminary results do not contradict the hypothesis of SCHAEFER (1986, 1987) supporting the monophyly of Ancistrinae + Hypostominae. The monophyly of the Ancistrinae suggested by ISBRÜCKER (1980) and SCHAEFER (1986), however, is not supported by the analysis of the mitochondrial rRNA genes. Instead, our data suggest a paraphyly of the Ancistrinae as it includes all the Hypostominae we have examined. Using the MP method we can enforce the monophyly of the ancistrines but the shortest tree obtained was nine steps longer than the one without topological assumptions. This test reinforces the suspected paraphyly of the Ancistrinae. Thus, there is a contradiction between the molecular data and the uniquely derived osteological characters found by SCHAEFER (1986, 1987) supporting the monophyly of Ancistrinae. Nevertheless, our results do not contradict the hypothesis that the mecanism of evertibility of the interopercular tuft of odontodes has evolved only once in the history of Ancistrinae (ISBRÜCKER 1980). If they are confirmed by further investigations that would imply that this mecanism of evertibility and its related structures have disappeared in the lineage leading to present Hypostominae.

Our molecular hypothesis is also in contradiction with HOWES (1983) proposal, which includes a polyphyletic view of ancistrines, because it discards *Chaetostoma* from the clade including *Ancistrus* and it places the Loricariinae within the clade of Hypostominae + Ancistrinae as presently defined.

The tree in figure 4 shares one point with the consensus tree of ancistrine relationships given by SCHAEFER (1986) (fig. 5): *Ancistrus* and *Chaetostoma* are members of a same lineage (the higher ancistrines of SCHAEFER). However, in our tree

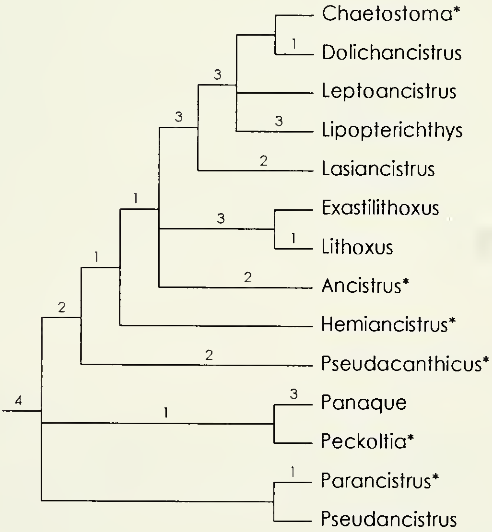

FIG. 5

Phylogenetic hypothesis of relationships among Ancistrinae species proposed by SCHAEFER (1986), based on osteological characters. Numbers above each branch represent the number of uniquely derived characters found by SCHAEFER. Taxa included in this study are indicated with an asterisk.

this last clade forms the sister group of the hypostomines plus the lower ancistrines *sensu* SCHAEFER analysed here. All the *Ancistrus* species included in our study cluster together in a well-supported clade including the type species, *A. cirrhosus* (Valenciennes). There is strong evidence that *A. ranunculus* belongs to this genus, as proposed by MULLER *et al.* (1994).

The phylogenetic relationships among the genera of clade C (fig. 4), and especially the three genera of hypostomines, could not be established with our sequence data. This is probably due to an insufficient sampling size of the numerous hypostomine group rather than a lack of sequence variability because the well resolved *Chaestostoma* + *Ancistrus* clade showed lower sequence variability than the clade C. It is also possible that these taxa have undergone an explosive radiation which could explain the difficulty in resolving the internal branches. In consequence, no indication about the monophyly of the Hypostominae is given.

Our high level taxonomy analysis of the relationships between some Ancistrinae and Hypostominae revealed the presence of two clades which do not correspond to the present definition of Hypostominae and Ancistrinae, the later being paraphyletic. The analysis of new species sequences could clear up the phylogeny of this group.

Acknowledgments

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APPENDIX 1: Specimens

Ingroup taxa:

Loricariidae, Hypostominae

- *Cochliodon* sp.,Venezuela, Rio Alto Orinoco, vicinity of San Carlos, lg H. Bleher, MHNG 2585.16. EMBL/GenBank: Y08287; Y08335.
- *Glyptoperichthys joselimaianus* Weber, Brasil, loc. unknown, 1995, commercial source, MHNG 2585.17. EMBL/GenBank: Y08286; Y08334.
- *Hypostomus affinis* (Steindachner), Brasil, RJ, Rio Paraiba do Sul, 3 km W. of Sapucaia, 10.XII. 1990, lg R. Mazzoni, W. Costa & C. Weber, MHNG 2543.65 (Br 153). EMBL/GenBank: Y08288; Y08336.
- *Hypostomus* cf. *punctatus* Valenciennes, Brasil, RJ, Ubatiba, Marica, 4.XII.1990, lg. R. Mazzoni & C. Weber, MHNG 2543.27 (Br 148). EMBL/GenBank: Y08289; Y08337.

Ancistrinae

- *Ancistrus cirrhosus* (Valenciennes), Argentina, Buenos Aires, La Choza, Rio Lujan drainage, 15.IX.1995, lg. O. Fernandez-Santos & S. Körber, MHNG 2583.37 (Mus 97). EMBL/GenBank: Y08277; Y08325.
- *Ancistrus dolichopterus* Kner, aquarium F1 of: Brasil, AM, Alto Rio Negro, close to the mouth of Rio Demini, 1989, lg. W. Römer (26.VII.1990, K. Holota), MHNG 2585.13 (Mus -). EMBL/GenBank: Y08276; Y08324.
- *Ancistrus multispinis* (Regan), Brasil, RJ, Cachoeira de Macacu, 14.XII.1994, lg. C. Bizerril, P. Perez-Neto & C. Weber, MHNG 2572.3 (Br 94-2). EMBL/GenBank: Y08279; Y08327.
- *Ancistrus pirareta* Muller, Paraguay, Cordillera, Salto Pirareta, Rio Tebicuary-mi drainage, 15-16.XI.1990, lg. C. Dlouhy, V. Mahnert & S. Muller, MHNG 2542.84 (Pira 8+12). EMBL/GenBank: Y08278; Y08326.
- *Ancistrus ranunculus* Muller, Rapp Py-Daniel & Zuanon, Brasil, PA, Rio Xingu, IV.1995, aquarium import D. Fisher, MHNG 2583.38 (Mus 105). EMBL/GenBank: Y08280; Y08328.
- *Chaetostoma* aff. *fischeri* Steindachner, Ecuador, Manabi, Solanillo, Rio Daule drainage, 16.VIII.1995, A. de Chambrier & C. Weber, MHNG 2575.45 (EC 95-6). EMBL/ GenBank: Y08281; Y08329.
- *Hemiancistrus hammarlundi* Rendahl, Ecuador, Manabi, Solanillo, Rio Daule drainage, 16.VIII.1995, A. de Chambrier & C. Weber, MHNG 2575.46 (EC 95-5+ unnum.). EMBL/GenBank: Y08284; Y08332.
- *Parancistrus aurantiacus* (Castelnau); Brasil, loc. unknown, X. 1994, aquarium import D. Fisher, MHNG 2583.39 (Mus 73). EMBL/GenBank: Y08282; Y08330.
- *Peckoltia vittata* (Steindachner), Brasil, PA, Rio Xingu, XI.1995, aquarium import D. Fisher, MHNG 2578.93 (Mus 85). EMBL/GenBank: Y08285; Y08333.
- *Pseudacanthicus spinosus* (Castelnau), Brasil, PA, Rio Xingu, XI.1995, aquarium import D. Fisher, MHNG 2578.28 (Mus 77). EMBL/GenBank: Y08283; Y08331.

OUTGROUP TAXA:

Loricariidae, Loricariinae

- *Loricaria* cf. *simillima* Regan, Peru, Loreto, Rio Maranon, vicinity of Iquitos, I.1996, lg. H. Bleher, MHNG 2583.23. EMBL/GenBank: Y08290; Y08338.
- *Rineloricaria* sp., Colombia, Guainia, vicinity of Puerto Inirida, Rio Guaviare drainage, I.1996, lg. H. Bleher, MHNG 2583.24. EMBL/GenBank: Y08291; Y08339.

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REVUE SUISSE DE ZOOLOGIE 104 (1): 199-206; mars 1997

Redescription of *Spinturnix punctata* (Sundevall, 1833) (Acari, Mesostigmata, Spinturnicidae), a specific parasite of *Barbastella barbastellus* (Chiroptera, Vespertilionidae)

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Redescription of *Spinturnix punctata* (Sundevall, 1833) (Acari, Mesostigmata, Spinturnicidae), a specific parasite of *Barbastella barbastellus* (Chiroptera, Vespertilionidae). – The authors redescribe *Spinturnix punctata* (Sundevall 1833) (Acari, Mesostigmata, Spinturnicidae), specific parasite of *Barbastella barbastellus* (Chiroptera, Vespertilionidae) with original illustrations and morphology study. A synopsis of the knowledge, concerning the Spinturnicidae ectoparasites of Vespertilionidae in the palearctic region is presented.

Key-words: taxonomy – Acari – Spinturnicidae – *Spinturnix punctata* – Chiroptera.

INTRODUCTION

During the revision of the family Spinturnicidae in 1960, RUDNICK placed many species under the heading "*species inquirendae*", considering that these species, poorly described, cited in several publications and whose types may still exist, would be further redescribed. ("I hopefully anticipate that these species may be identified and adequately described in the foreseeable future"). This was the case for *Spinturnix emarginata* (Kolenati, 1856) redescribed by DUSBABEK in 1964. As part of our study on the "*acuminata*" complex we were interested in ectoparasites of *Barbastella barbastellus*. In 1833 in Sweden, SUNDEVALL described, under the name of *Pteroptus punctatus*, a Spinturnicidae twice found on the wing membranes of *B. barbastellus*. The type specimens unfortunately disappeared and all attempts to find them again (OUDEMANS 1936), including ours, have failed. KOLENATI, probably unaware of SUNDEVALL's publication, described the same parasite in 1857 under the names *Pteroptus barbastelli*, and then *Diplostaspis barbastelli* in 1859. Types are intraceable

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in the collections of Kolenati. Finally, this ectoparasite was described again by Dusbabek (1962) as a subspecies of *Spinturnix acuminata, S. a. barbastelli.* Our research on the "*acuminata*" group allows us to consider the ectoparasite of *B. barbastellus* as a genuine species and not as a subspecies of *S. acuminata.* We therefore redescribe this species keeping the name *S. punctata* (Sundevall, 1833), as the oldest name available; Rudnick (1960) kept the same name.

MATERIAL AND METHODS

As a result of the small number of *B. barbastellus* captured few authors have been able to examine their parasites. We were able to gather 17 specimens of *S. punctata* (8 males, 7 females and 2 nymphs) in Switzerland and Corsica.

List of the material

Noblet rec.: Col de Capronale, Corsica, France (2 ♀, 29/08/87); Frauenfeld, Suisse (1 ♂, 1 ♀, 13/07/53).

Aellen rec.: n° 296: grotte aux Fées infér., Vallorbe, Vaud, Suisse (1♂, 28/01/50); n° 2644: (1♂, 24/01/62); n° 458-468: grotte aux Fées supér. Vallorbe, Vaud, Suisse (3♂, 2♀, 25/11/51); n° 2685: Col de Bretolet, Valais, Suisse (2♂, 1♀, 2 Nymphs, 02/08/62); n° 3149: grotte de la Diau, Thorens-les-Glières, Haute-Savoie, France (1♀, 09/12/65).

Method: the specimens were processed according to a previously described method (Deunff 1978), the mounting was carried out in Canada balsam and the photonic microscrope observation occurred in clear background and principally in phase contrast. Drawings were made with a ZEISS camera lucida.

Spinturnix punctata (Sundevall, 1833)

SYNONYMY

Pteroptus punctatus Sundevall, 1833: Stiles & Nolan 1931; Oudemans 1936.
Spinturnix punctatus, van Eyndhoven 1943; Rudnick 1960; Deunff *et al.* 1986.
Pteroptus barbastelli Kolenati, 1857; Berlese 1892; Stiles & Nolan 1931; Collins 1931.
Diplostaspis barbastelli, Kolenati 1859; Koch 1865.
Spinturnix sp., van Eyndhoven 1950.
Spinturnix barbastelli, Collins 1931; van Eyndhoven 1943; Haitlinger 1978; Rybin 1983.
Spinturnix acuminatus bohemicus Dusbabek, 1962; Dusbabek 1964, 1970; Beron 1965.
Spinturnix acuminatus barbastelli, Dusbabek 1964, 1970, 1972; Pinchuk 1971.
Spinturnix punctata, Uchikawa *et al.*, 1994.

REDESCRIPTION

Female: neotype (figures: 1, 2 and 3)

Dimensions: length (from anal extremity to the point of the hypostome): 1,169 µm; width (at the level of the peritremes): 784 µm. Sternal shield: length: 166 µm; greatest width: 134 µm. Dorsal plates: length: 799 µm; greatest width: 576 µm.

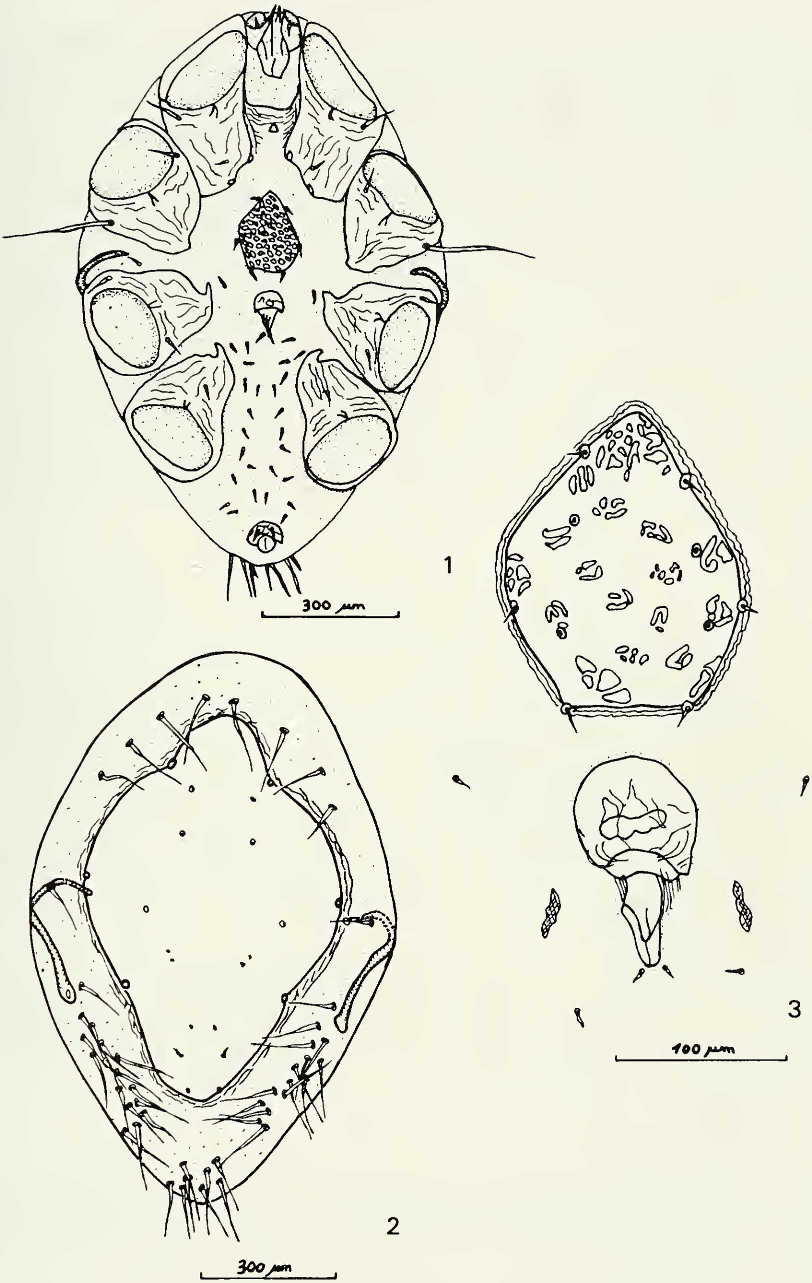


Fig. 1-3

1. Female *Spinturnix punctata*, ventral view; 2. Female *Spinturnix punctata*, dorsal view; 3. Female *Spinturnix punctata*, sternal and genital shield.

Ventral surface: a relatively large sternal shield: piriform, slightly longer than broad. Its anterior end forming a wide point. Its posterior limit is rectilinear. The widest region has on each side marked angles. Three pairs of setae surround the shield and are established on it or in the contact with it. The relief is made up of big polyhedric patterns offering a secondary relief alternating with small punctiform patterns. A polyhedric jugular shield, of small size, is present. The genital plate is anteriorly curved and its size relatively important, it is situated away from the sternal shield. The genital duct is covered with a cuticle with a little marked relief. The genital setae are short; we observe the presence of 30 setae between the sternal shield and the anal plate (the two anal setae excepted).

Dorsal surface: an ovoid dorsal plate, with lateral depressions anteriorly and posteriorly at the level of the excretory orifices. Four pairs of propodosomal setae are present, as well as one pair of short metapodosomal setae and 41 opisthosomal setae set along the edge of the body (including 8 terminal setae). The peritremes are dorsal and located at the level of legs III, they are anteriorly and posteriorly prolonged between coxae II and III.

Male (figs: 4, 5 and 6)

Dimensions: length: 992 µm; width: 730 µm. Sternal shield: length: 348 µm; width: 182 µm. Dorsal plate: length: 784 µm; width: 553 µm.

Ventral surface: a stretched-out sternal shield, its anterior region bearing the genital orifice is narrow and its angles are marked in its widest part. Its base is narrow and pointed with a depression on each side. Its relief is made up of variable patterns of punctiform or vermiform elements. Laterally 3 pairs of short setae are located on the shield. A 4th pair is located, outside the shield, at the level of coxæ III. A 5th pair of setae is located behind and away from the sternal shield. A small and fusiform jugular shield is present. Between the sternal shield and the anal plate 15 generally paired setae are found.

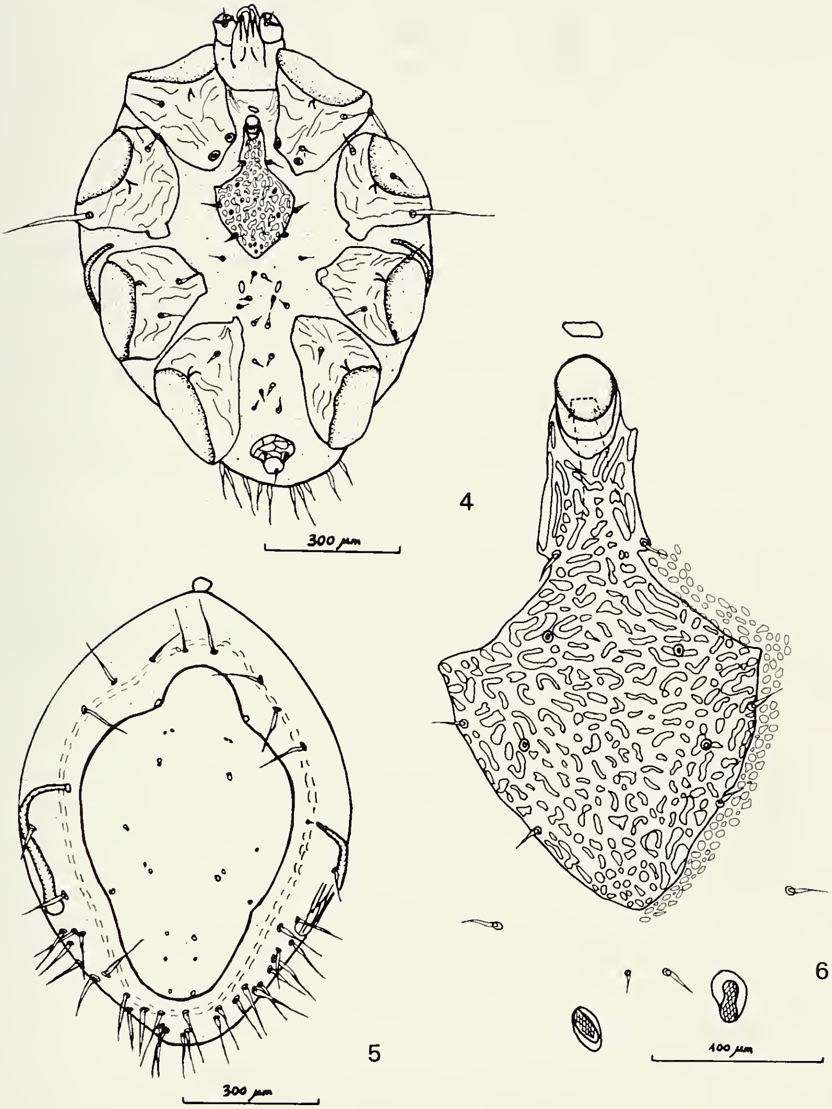
Dorsal surface: a wide and anteriorly curved dorsal plate, with little marked shoulderings with a narrow posterior region. Around the plate we find four pairs of propodosomal setae, one pair of short metapodosomal setae and 21 opisthosomal setae. The peritremes are dorsal, situated at the level of legs III and continuing ventrally forward between legs II and IV.

MORPHOLOGICAL STUDY

For the following morphological characters are indicated: the extremes (maximum and minimum), the mean (m), the standard deviation (SD) and the median line.

Females: n = 7.

Dimensions: length: m = 1,273 µm (1,138 to 1,430); SD = 107; median line = 1,238 µm; width: m = 893 µm (784 to 999 µm); SD = 85.91; median line = 876 µm. Shield: length: m = 179 µm (166 to 194); SD = 10.35; median line = 180 µm; width:



FIGS 4-6

4. Male *Spinturnix punctata*, ventral view; 5. Male *Spinturnix punctata*, dorsal view; 6: Male *Spinturnix punctata*, sternal shield.

m = 150 µm (134 to 168); SD = 10.98; median line = 148 µm. Dorsal plate: length m = 852 µm (799 to 868); SD = 24.08; median line = 861 µm; width: m = 591 µm (576 to 615); SD = 14.33; median line = 584 µm.

Number of ventral opisthosomal setae: m = 26 (23 to 30), SD = 2.36, median line = 26; number of dorsal opisthosomal setae: m = 40 (37 to 44), SD = 2.28, median line: 39.

Males: n = 8.

Dimensions: length: m = 975 µm (922 to 1,015); SD = 32.99; median line = 992 µm; width: m = 718 µm (676 to 779); SD = 29.37; median line = 715 µm. Shield: length: m = 334 µm (316 to 350); SD = 14.28; median line = 342 µm; width: m = 187 µm (182 to 194); SD = 4.28; median line = 188 µm. Dorsal plate: length: m = 766 µm (738 to 815); SD = 26.62; median line = 761 µm; width: m = 545 µm (515 to 569); SD = 18.38; median line = 553 µm.

Number of ventral opisthosomal setae: m = 16 (15 to 18), SD = 0.95, median line = 16; number of dorsal opisthosomal setae: m = 25 (21 to 29), SD = 2.78, median line = 25.

Deposition of type: the female neotype, is deposited in the Muséum d'histoire naturelle de Genève, Suisse.

The other specimens, used for morphological study, are deposited in the collections of the Laboratoire de Parasitologie Pharmaceutique, Faculté des Sciences Pharmaceutiques et Biologiques, Université de Rennes I, France.

Type host: Barbastella barbastellus Schreber, 1774.

Type habitat: Col de Capronale, Corse, France.

Distribution: all the western palearctic region, following its host.

Phenology: The samples studied were achieved between June and August, we observed several gravid females and deutonymphs. We can accordingly suppose that the period of reproduction of this species is situated in July–August, which is the case for *S. acuminata* and for most of the ectoparasite species of Vespertilioninæ in Europe (DEUNFF & BEAUCOURNU 1981).

DISCUSSION

Described, redescribed, forgotten then rediscovered several times, *S. punctata* deserves at last its status of species. The general morphology and particularly the shields, classifies it in the group "*acuminata*" beside *S. acuminata* (host: *Nyctalus noctula*), *S. helvetiæ* (host: *N. leisleri*) and *S. nobleti* (host: *Pipistrellus savii* = *Hypsugo savii*). From a parasitology point of view we therefore find in the western palearctic region a relatively homogeneous group of Spinturnicidae parasites of the genus *Nyctalus*, of *B. barbastellus* and of *Pipistrellus savii* (genus: *Hypsugo*). This last genus is yet considered by mammalogists as close to Eptesicus which carries a parasite totally different from the "*acuminata*" complex (DEUNFF *et al.* 1986). On the other hand affinities probably exist between the group of the "*acuminata*" and *S. plecotina* (hosts: *Plecotus auritus* and *P. austriacus*). If we sum up all we know so far about the parasites of *Vespertilioninae* in the considered region, we can distinguish 3 groups: the first one including 5 species (4 of the "*acuminata*" group and *S. plecotina*), the second one with apparently only one species *S. kolenatii* (hosts: *Eptesicus serotinus* and *E. nilsonni*), the third one with actually 4 species: *S. mystacinus* (hosts: *Myotis mystacinus* and *M. brandti*), *S. emarginatus* (host: *M. emarginatus*) and the "*myoti*" complex including for the moment two species *S. andegavina* (host: *M. daubentoni*: *M. nathalinae*) and *S. myoti* which could parasitize *M. myotis*, *M. blythii*, *M. bechsteini*, *M. dasycneme*, *M. capaccinii*, *M. nattereri*.

Parasitism has modified a lot the Spinturnicidae and these morphological adaptations leave us few elements allowing a phylogenetic classification. Moreover, beyond the phyletic affinities between the host bats, we must take into account the behavioural similarities which can bring together very different bat species in the same resting, wintering and dropping places. During the evolution of the *Spinturnicidae*, such contacts between host species have probably allowed capture phenomena of parasites and a speciation on the new host. If in the majority of cases the phylogenies of hosts and parasites are closely linked, one must be ready to meet exceptions which will show a discrepancy between the parasitological results and the data of mammalogists. This is the case for *Hypsugo savii*, close to *E. serotinus* for mamalogists and whose parasites resemble those of the genus *Nyctalus* and of *B. barbastellus* but are very different from those of *E. serotinus* (DEUNFF *et al.* 1990).

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REVUE SUISSE DE ZOOLOGIE 104 (1): 207-216; mars 1997

Three new species and distributional records of *Micrambe* C.G. Thomson, 1863 and *Cryptophagus* Herbst, 1792 (Coleoptera: Cryptophagidae) from Israel and Turkey

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Three new species and distributional records of *Micrambe* **C.G. Thomson, 1863 and** *Cryptophagus* **Herbst, 1792 (Coleoptera, Cryptophagidae) from Israel and Turkey. -** Three new species of *Micrambe* C.G. Thomson and *Cryptophagus* Herbst from Israel and Turkey are described and illustrated: *Micrambe loebli* n.sp., *Cryptophagus galilei* n.sp. and *Cryptophagus besucheti* n.sp. New data on other species of the genus *Micrambe* and *Cryptophagus* are provided.

Key-words: Coleoptera - Cryptophagidae - *Micrambe* - *Cryptophagus* - new species - Israel - Turkey.

INTRODUCTION

The object of this account, is to contribute to the knowledge of Cryptophagidae from the palaearctic region. Below, we present the results of the study of material collected by Dr. Cl. Besuchet and Dr. I. Löbl from Israel, Lebanon and Turkey. The material consist of 505 specimens, belong to 2 genera and 27 species. Of these, three are new to science and are described below under the names *Micrambe loebli*, *Cryptophagus galilei* and *C. besucheti*.

ABBREVIATIONS:

(MHNG) Muséum d'histoire naturelle, Geneva. (L) length; (WL) width/length ratio.

Micrambe loebli n. sp.

TYPE MATERIAL: Holotype (male): Israël, Galilée, au dessous Safad, 500 m., 30.V.1973 (leg. Löbl). Paratypes: same date as Holotype (2 females); Holotype and 1 female in Coll. MHNG; 1 female in Coll. J.C.Otero, University of Santiago de Compostela, Spain.

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Length 1.8 - 2.1 mm. Body oval, convex. Coloration reddish brown, with simple (decumbent) pubescence. Metathoracic wings well developed.

Head: eyes (L=0.120 mm.) normal, not prominent, with ocular facets larger (∅ = 16 μ) (Fig. 4) than the punctures of the head. Antennae (Fig. 3) short, not reaching the rear edge of the pronotum; 1st and 3rd antennal segments equal in length, 2/3 longer than the 4th, 6th, 7th and 8th segments, which are themselves equal in length.

Pronotum transverse (Fig. 1, 2) (WL= 1.6 - 1.7). Anterior callosities long (2/5 of length of pronotum), tapering posteriorly to a fine point, not projecting beyond the lateral edge of the pronotum; surface of callosity scarcely visible in dorsal view, punturated at its centre. Lateral pronotal margins convex in dorsal view. Pronotal puncturation (Fig. 5) small (∅= 10 μ) and dispersed (between-puncture distance about two times puncture diameter).

Elytra three times longer than pronotum. Elytral puncturation (Fig. 6) size and dispersion as on pronotum.

Aedeagus (Fig 7) with endophallic orifice visible and prepucial sac diffuse; endophallus bearing numerous small spines and with two sclerotised rods (Fig. 9) at the end of the aedeageal apodeme. Parameres (Fig. 8) with two short apical bristles and numerous setae bearing pores on the distal half of its internal face.

DIAGNOSIS

The morphology of the pronotal callosity (long, tapering posteriorly to a fine point, scarcely visible in dorsal view) is sufficient to distinguish this species from other members of the genus. In addition, aedeagus morphology is distinctive.

ETYMOLOGY

This species is named in recognition of the generosity of Dr. I. Löbl in supplying us with the material.

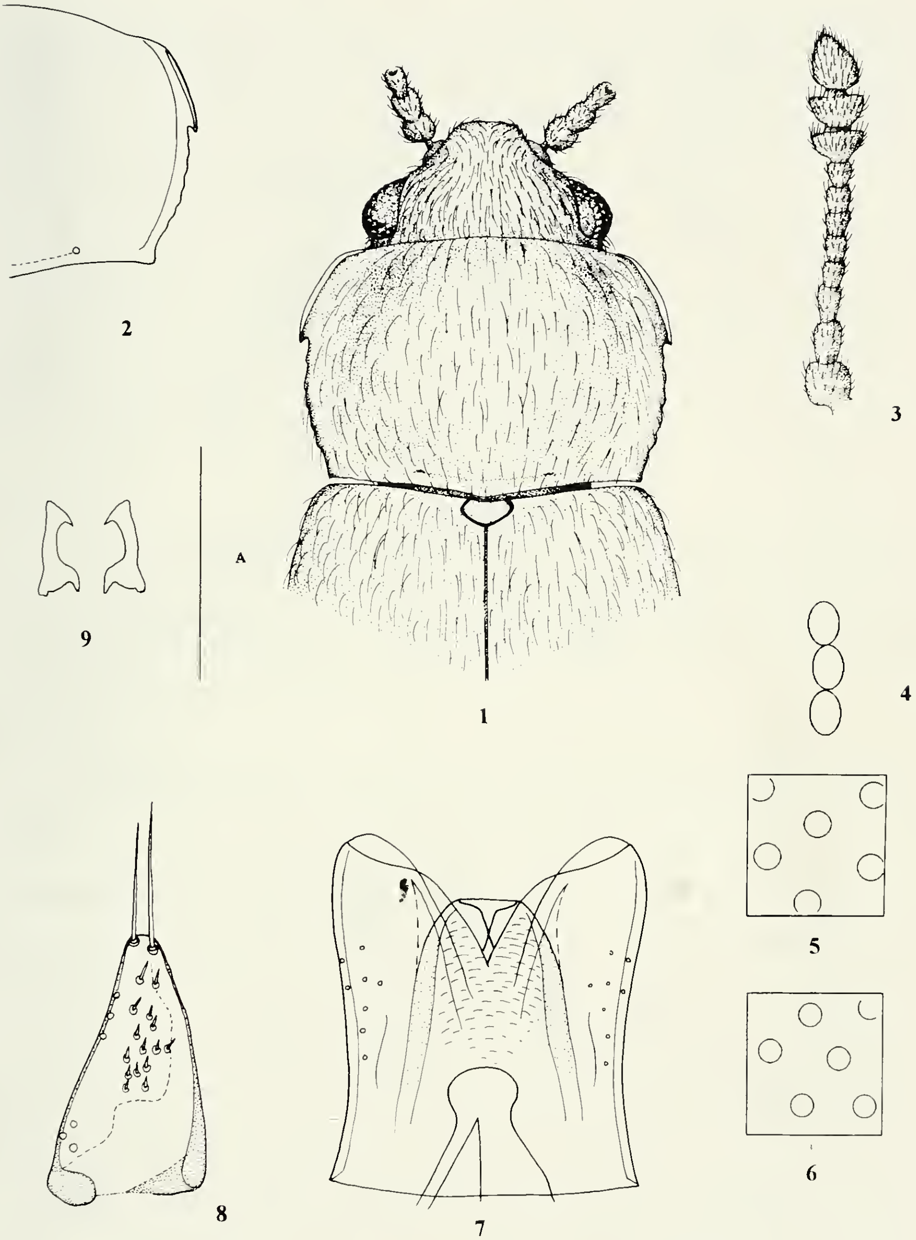
Cryptophagus galilei n. sp.

TYPE MATERIAL: Holotype (male): Israël, Galilée, Montfort, 19.IV.1982 (leg. Besuchet-Löbl) in Coll. MHNG. Paratypes: 5 males and 17 females, Israël, Galilée, Tel Dan, 24.IV.1982 (leg. Besuchet-Löbl) in Coll. MHNG; 1 male in Coll. J.C.Otero, University of Santiago de Compostela, Spain.

Length 1.7 - 2.1 mm. Body oval, convex. Coloration reddish brown, with double pubescence (erect and decumbent). Metathoracic wings well developed.

Head: eyes prominent (L= 0.090 mm.), with ocular facets of similar size (∅= 14 μ) (Fig. 13) to the punctures of the head. Antennae (Fig. 12) short, not reaching the rear edge of the pronotum; 2nd antennal segment 1 - 2 times longer than 3rd; 4th, 6th, 7th and 8th segments of equal length, about 2/3 of length of 2nd.

Pronotum transverse (Fig. 10, 11) (WL = 1.6 - 1.7), as wide at base as at apex. Anterior callosities long (1/4 of length of pronotum), in dorsal view projecting beyond



FIGS 1- 9

Micrambe loebli n.sp. 1: General view (A= 0,558 mm.).- 2: Pronotum (A= 0,558 mm.).- 3: Antennae (A= 0,425 mm.).- 4: Size and shape of ocular facets.- 5-6: Comparison of punturation between pronotum and elytra.- 7-8: Dorsal view of aedeagus (A= 0,125 mm.) and left paramere (A= 75 μ).- 9: Sclerotised rods.

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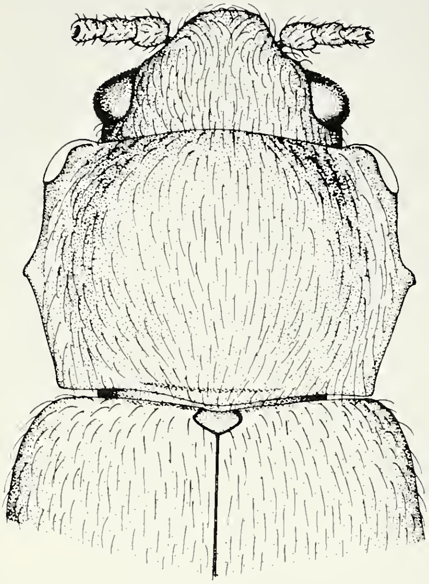

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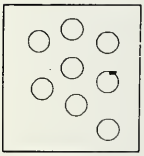

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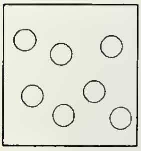

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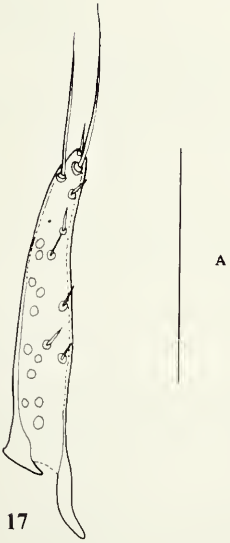

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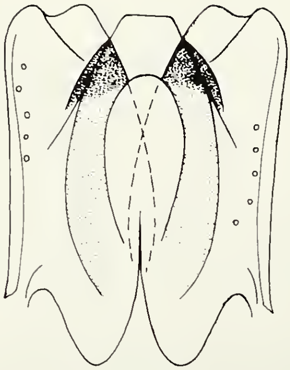

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FIGS 10- 18

Cryptophagus galilei n.sp..- 10: General view (A= 0,494 mm.).- 11: Pronotum (A= 0,484 mm.).- 12: Antennae (A= 0,450 mm.).- 13: Size and shape of ocular facets.- 14- 15: Comparison of punturation between pronotum and elytra.- 16- 17: Dorsal view of aedeagus (A= 0,180 mm.) and right paramere (A= 60 μ).- 18: Sclerotised rods.

the anterior edge of the pronotum but not prominent laterally; angle between the posterior edge of the callosity and the lateral wall of the pronotum obtuse. Surface of callosity scarcely visible in dorsal view, and edge not prominent. Lateral margin of pronotum bears tooth just posterior to the anterior-posterior midpoint; between tooth and base, margin straight. Pronotal puncturation pronounced; between-puncture distance less than or equal to puncture diameter (∅= 12 μ) (Fig. 14).

Elytra three times longer than pronotum. Elytral puncturation somewhat smaller and more dispersed than on pronotum (Fig. 15): puncture diameter about 10 μ, between-puncture distance > 10 μ.

Aedeagus (Fig 16) of *C. dentatus* type, with preputial sac bearing a densely granulate apical cap. Endophallic orifice visible. Endophallus bearing numerous minute spines. Aedeageal apodeme with two sclerotised rods at apex (Fig. 18). Parameres extremely thin and with a curved external edge (Fig. 17). Two short apical setae and infrequent pores, these either with or without bristles.

DIAGNOSIS

The parameres of *C. galilei* are similar to those of *C. sporadum* (extremely narrow, with few pores, these either with or without bristles). However, *C. galilei* can be distinguished from *C. sporadum* by its aedeagus (with a apical expansion in *C. sporadum*, but dentatus-type in *C. galilei*), by the configuration of the endophallic casing and by pronotum morphology.

ETYMOLOGY

This species is named in reference to the region in which the type material was collected.

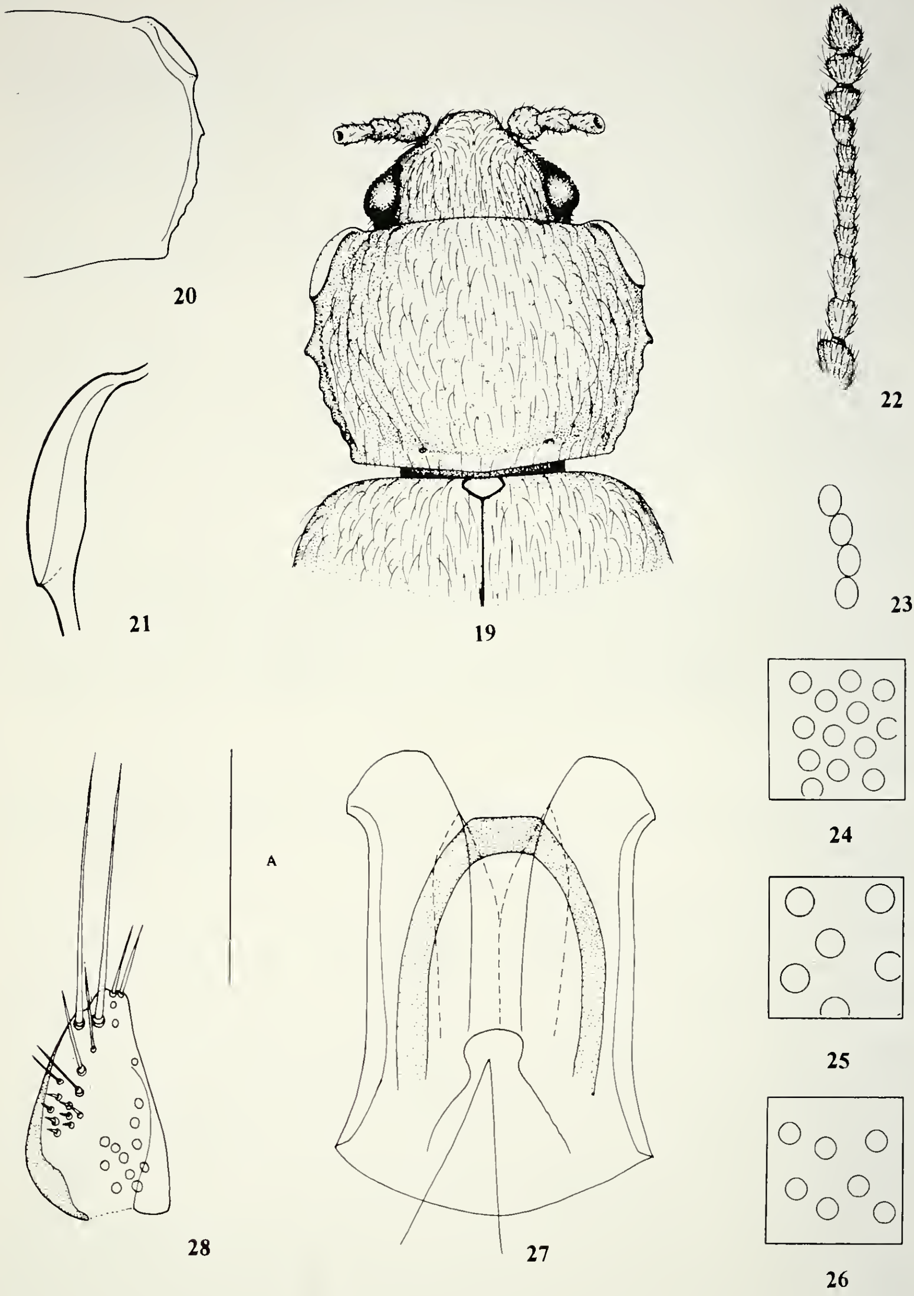
Cryptophagus besucheti n. sp.

TYPE MATERIAL: Holotype (male): Adana, Tekir, Turkey, 4.VI.1967, 1,200 m. (leg. Besuchet) in Coll. MHNG.

Length 1.9 mm. Body convex. Coloration yellowish brown, with long double pubescence (erect and decumbent). Lacking membranous wings.

Head: eyes (L= 0.100 mm.), with ocular facets larger (∅= 20 μ) (Fig. 23) than the punctures of the head (∅= 12 μ) (Fig. 24). Antennae (Fig. 22) not reaching the rear edge of the pronotum; 3rd antennal segment 1 - 2 times longer than 2nd; 5th, 7th and 8th segments of equal length, about 2/3 of length of 3rd.

Pronotum moderately transverse (Fig. 19, 20) (WL =1.5). Anterior callosities (Fig. 21) long (1/4 of length of pronotum); angle between the posterior edge of the callosity and the lateral wall of the pronotum obtuse. Surface of the callosity scarcely visible in dorsal view, punctured at its centre and with a well-marked border. Lateral tooth in middle of pronotum side. Pronotum sides rounded and converging to the base from the tooth. Pronotal puncturation (Fig. 25) pronounced and dispersed; between-puncture distance greater than or equal to puncture diameter (16 μ).



FIGS 19- 28: *Cryptophagus besucheti* n.sp. .- General view (A= 0,546 mm.).- 20: Pronotum (A= 0,525 mm.).- 21: Callosity (A= 0,166 mm.).- 22: Antennae (A= 0,500 mm.).- 23: Size and shape of ocular facets.- 24- 26: Comparison of punturation between pronotum and elytra.- 27-28: Dorsal view of aedeagus (A= 0,117 mm.) and right paramere (A= 70 μ).

Elytra two times longer than pronotum.`Elytral puncturation as pronounced but more dispersed than on pronotum (Fig. 26): between-puncture distance alawys greater than puncture diameter (∅=12 µ).

Aedeagus (Fig 27) with endophallic orifice clearly visible. Parameres (Fig. 28) with two or three apical setae, these as long as the paramere itself.

DIAGNOSIS

This species forms part of the group defined by double pubescence and the lack of metathoracic wings (BRUCE 1936). Other members of this group are *C. nitidulus* Miller and *C. simplex* Miller; *C. besucheti* can be distinguished from both by the characteristic morphology of its aedeagus and parameres.

ETYMOLOGY

This species is named in honour of its discoverer, Dr. Cl. Besuchet.

ADDITIONAL MATERIAL EXAMINED

Micrambe perrisi (Ch. Brisout, 1882)

TURKEY: Bursa, 23.V.1967, 1 ex. (Wittmer); Izmir, env. Çamlik, 8.V.1975, 1 ex. (Besuchet-Löbl).

Micrambe villosus (Heer, 1841)

ISRAEL: Galilée, 30.V.1975, 1 ex. (leg. Löbl). LEBANON: Damour, 20.III.1975, 1 ex. (Besuchet). TURKEY: Samsun, 20.V.1967, 1 ex.; Adana, 5.V.1967, 2 ex.; Istambul, 28.V.1967, 1 ex. (Wittmer); Balikesir, Ayvalik, 15.VII.1969, 1 ex. (Besuchet).

Micrambe vini (Panzer, 1797)

LEBANON: Damour, 4.IV.75, 1 ex. (Besuchet). TURKEY: Sinop, 20.V.67, 1 ex.; Balikesir, Ayvalik, 15.VII.69, 1 ex. (Besuchet-Löbl).

Cryptophagus cellaris (Scopoli, 1763)

ISRAEL: Mte Hermon, Golan, 23.X.82, 7 ex.; Galilée, au-dessous Safad,14.VI.73, 1 ex. TURKEY: Isparta, Egridir, Çandir, 6.V.75; Antakya, Sogukoluk, 2.V.78, 19 ex.; 3.V.78, 1 ex. (Besuchet-Löbl).

Cryptophagus deubeli Ganglbauer, 1897

TURKEY: Kars col entre Damal-Bsof, 13.VI.1986, 6 ex., 2,400-2,500 m.; SW. Artvin, 1.VI.1986, 1 ex., 1900 m. (Besuchet-Löbl).

Cryptophagus cylindrus Kiesenwetter, 1858

TURKEY: Mugla, Cröcova, 30.IV.75, 1 ex. (Besuchet-Löbl); Istanbul, Kilyos, 8.VII.69, 2 ex; Izmir, env. Çamlik, 8.V.75, 2 ex.; Balikesir, Ayvalik, 15.VII.69, 1 ex (Besuchet).

Cryptophagus hexagonalis Tournier, 1869

TURKEY: Adiyaman, Gölbasi, 10.V.77, 1 ex.; Adyyaman, 10.V.67, 1 ex.; Mersin, 22.IV.67, 1 ex.; Tokat, Turhal, 21.V.67, 1 ex.; Adana, 3.V.67, 1 ex.; 5.V.67, 1 ex. (Wittmer).

Cryptophagus lapidicola Reitter, 1879

TURKEY: Artvin, Hopa-Kemalpasa, 10.VI.86, 5 ex.; 14.V.67, 6 ex. (Besuchet-Löbl); Sinop, 20.V.75, 1 ex.; Sinop, Lala, 20.V.76, 36 ex. (Besuchet).

Cryptophagus laticollis Lucas, 1849

ISRAEL: Galilée, 24.V.75, 1 ex. (Löbl); Galilée, Eilon, N. Betzet, 22.IV.82, 1 ex.; Judée, Mevasseret, 30.IV.82, 1 ex.; Mar Muerto, Nahal Kidron, 28.IV.82, 3 ex.; Golan, Banias, 24.IV.82, 1 ex.; Mte Carmel, 17.IV.82, 2 ex. (Besuchet-Löbl). LEBANON: Damour, 24.III.75, 1 ex. (Besuchet). TURKEY: Antalya, Kemer, 4.V.75, 1 ex.; Antalya, 12 Km. du N. Manqugat, 26.IV.78, 1 ex. (Besuchet-Löbl).

Cryptophagus lycoperdi (Scopoli, 1763)

TURKEY: Mugla, Cröcek, 2.V.75, 1 ex.; Mersin, Yeniköy, 29.IV.78, 3 ex.; Antalya, Kislak, Yenköy, 2.V.78, 1 ex. (Besuchet-Löbl).

Cryptophagus micaceus Rey, 1889

TURKEY: Istanbul, 4.VI.67, 1 ex. (Besuchet).

Cryptophagus pallidus Sturm, 1845

ISRAEL: Golan, Banias, 17.IV.82, 2 ex.; Mte Carmel, 17.IV.82, 2 ex.; 28.V.73, 1 ex. (Besuchet-Löbl); Galilée, au dessous Safad; 14.VI.73, 4 ex.; 30.V.73, 3 ex.; 26.IV.82, 2 ex. (Löbl); Galilée, Mte Meron, 21.IV.82, 1 ex.; 27.V.73, 3 ex. (Besuchet-Löbl); Galilée, Montfort, 19.IV.82, 1 ex. (Besuchet-Löbl). LEBANON: Damur, 24.III.75, 1 ex; Beit Eddine, 30.III.75, 1 ex; Cedres Brouk, 31.III.75, 1 ex (Besuchet). TURKEY: Mersin, 22.IV.67, 6 ex.; Samsum, 20.V.67, 4 ex.; Turkey, V.67, 2 ex. (Wittmer); Iskenderum, 9.V.67, 1 ex. (Wittmer); Iskenderma, Sogukoluk, 9.V.67, 1 ex.; Istanbul, Foret de Belgrade, 10.VII.69, 9 ex. (Besuchet); Istanbul, Foret Tasdelen, 22.VII.69, 1 ex.; Istanbul, 8.VII.69, 2 ex.; Amasya, Bozdagh, 29.IV.75, 1 ex.; Artvin, 7.VI.86, 1 ex.; 9.VI.86, 1 ex. (Besuchet- Löbl); Artvin, Karkal Dagi, 11.VI.86, 7 ex.; Mersin, Yeniköy, 29.IV.76, 2 ex.; 29.IV.78, 1 ex.; Adana, 30.IV.78, 1 ex.; Sinop, 20.V.76, 1 ex.; Ankara, Söguksu, 24.V.67, 1 ex.; Ordu, 18.V.67, 1 ex.; Bursa, Uludag, 22.VII.69, 1 ex.; Tunceli, 5.VI.86, 1 ex. (Besuchet-Löbl).

Cryptophagus pilosus Gyllenhal, 1827

TURKEY: Antakya, Kislak Senküy, 2.V.78, 1 ex.; Artvin, E Hopa, 10.VI.86, 1 ex. (Besuchet-Löbl); Tokat, 21.V.67, 1 ex. (Besuchet); Mersin, 30.IV.75, 1 ex. (Besuchet-Löbl).

Cryptophagus postpositus J.Sahlberg, 1903

TURKEY: Isparta, Egridir Çandir, 6.V.75, 1 ex.; Bolu, Konuralp, AkÇakoca, 15.V.76, 1 ex. (Besuchet-Löbl).

Cryptophagus pseudodentatus Bruce, 1934

ISRAEL: Mte Carmel, 28.V.73, 10 ex. (Löbl); 17.IV.82, 1 ex.; Galilée, Tel Dan, 24.IV.82, 1 ex.; Galilée, au dessous Safad, 30.V.73, 1 ex. (Besuchet-Löbl). TURKEY: Izmir, env. Çamlik, 8.V.75, 2 ex.; Izmir, Meyermana, 9.V.75, 1 ex.; Izmir, Bergama-Kozak, 18.VII.69, 1 ex.; Artvin, 8.VI.86, 1 ex.; 7.VI.86, 2 ex; 9.VI.86, 1 ex.; Kars, 17.VI.86, 2 ex.; 16.VI.86, 1 ex. (Besuchet-Löbl); Samsun, Çarsamba, 18.V.67, 1 ex.; Antakya, Sogukulok, 3.V.78, 1 ex.; Bursa, 22.VII.69, 1 ex. (Besuchet); Antalya, Kislak-Senköy, 2.V.78, 2 ex.; Istanbul, 14.VI.67, 1 ex.; 28.IV.67, 1 ex. (Besuchet); Adana, Karatepe, 3.V.67, 1 ex. (Wittmer).

Cryptophagus reflexicollis Reitter, 1876

TURKEY: Artvin, 9.VI.86, 4 ex. (Besuchet-Löbl).

Cryptophagus saginatus Sturm, 1845

TURKEY: Bursa, Uldag, 13.VI.76, 1 ex. (Besuchet-Löbl).

Cryptophagus scanicus (Linnaeus, 1758)

TURKEY: Samsun, ÇarÇamba, 18.V.67, 2 ex.; Artvin, 7.VI.86, 3 ex. (Besuchet-Löbl).

Cryptophagus scutellatus Newman, 1834

TURKEY: Sinop, Bürnük, 20.V.76, 3 ex. (Besuchet-Löbl).

Cryptophagus setulosus Sturm, 1845

TURKEY: Gümüshane, Erzican, Kelkit, 2 ex. (Besuchet-Löbl).

Cryptophagus skalitkyi Reitter, 1875

TURKEY: Kars, Kägizman, 18.VI.86, 165 ex.; Izmir, Meryemana, 9.V.75, 1 ex.; Artvin, 7.VI.86, 1 ex. (Besuchet-Löbl).

Cryptophagus sporadum Bruce, 1934

ISRAEL: Galilée, Safad, 30.V.73, 7 ex.; Galilée, Eilon, N. Betzet, 22.IV.82, 1 ex. (Lóbl), TURKEY: Amasya, 22.V.67, 2 ex.; Mersin, Yeniköy, 29.IV.78, 1 ex.; Izmir, Meryemana, 9.V.75, 1 ex. (Besuchet).

Cryptophagus subvittatus Reitter, 1887

TURKEY: Izmir, env. Çamlik, 8.V.1975, 1 ex. (Besuchet-Löbl).

Cryptophagus thomsoni Reitter, 1875

ISRAEL: Mte Carmel, 17.IV.82, 7 ex.; Galilée, Eilon, N Betzet, 22.IV.82, 18 ex.; Golan, Mte Hermon, 23.IV.82, 2 ex. (Besuchet-Löbl). LEBANON: Damour, 4.IV.75, 1 ex.; Jeita, 26.III.75, 1 ex. (Besuchet). TURKEY: Balikesir, Ayvalik, 15.VII.69, 3 ex.; Sinop, Lala, 20.V.76, 2 ex.; Sinop, Bektas, 20.V.76, 1 ex.; Izmir, Meryemana, 9.V.75, 1 ex.; Zonguldak, Eregli-Baliköy, 15.V.76, 1 ex.; Konya, 7.V.78, 2 ex.; Antakya, E.Yecilkent, 4.V.78, 1 ex. (Besuchet-Löbl); Istanbul, 4.VI.67, 1 ex.; Istanbul, Foret du Tasdelen, 28.V.67, 2 ex.; Isparta, Egridir, Çandir, 6.V.75, 5 ex.; Gümushane, Erzican, Kelkit, 4.VI.86, 1 ex.; Manisa, Salihli, 29.IV.75, 1 ex.; Tunceli, Ovacik, 3.V.67, 1 ex. (Besuchet-Löbl); Ordu, env. Tekkiraz, 18.V.67, 1 ex.; Adana, 3.V.67, 1 ex. (Wittmer).

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REVUE SUISSE DE ZOOLOGIE 104 (1): 217-227; mars 1997

The *Oniscus asellus* complex (Crustacea: Isopoda: Oniscidea) in the Iberian Peninsula with the description of a new species

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The *Oniscus asellus* complex (Crustacea: Isopoda: Oniscidea) in the Iberian Peninsula with the description of a new species. - Extensive fieldwork in the northwest of the Iberian peninsula has resulted in the discovery of *Oniscus galicianus* sp. nov. which is closely related to *ancarensis* Bilton, and *asellus* Linnaeus. Together these three taxa are considered to form a distinct clade within the genus-the *asellus* complex. *O. galicianus* is described and distinguished from other members of the complex using pleopodal anatomy and multivariate morphometry. The discovery of *galicianus* significantly modifies previous ideas concerning the distribution and evolution of the *asellus* complex in southwest Europe. Only the nominate subspecies of *O. asellus* occurs in the Iberian peninsula. This finding is discussed and the suggestion made that the intraspecific taxa of *asellus* differentiated elsewhere in western Europe.

Key-words: woodlouse - systematics - Spain - biogeography - new species.

INTRODUCTION

The genus *Oniscus* was revised by BILTON (1992) who recognised four species, three of which are confined to the extreme south-west of Europe. Subsequent to this it was discovered that *Oniscus asellus* Linnaeus consists of two subspecies and a multitude of intermediate populations which appear to be of hybrid origin (BILTON 1994). In 1990 a population of *Oniscus* was sampled in the province of La Coruña, Galicia, northern Spain and identified as belonging to *O. asellus* s. lat. These animals were included as intermediates between *asellus* and *occidentalis* Bilton (BILTON 1994). The author conducted further extensive fieldwork in the northwest of the Iberian peninsula during the first half of 1993, when a number of similar populations of *Oniscus* were discovered. A thorough consideration of the morphology and ecology of these isopods has led to the conclusion that rather than belonging to *asellus* these represent yet another endemic species of the genus. This is described here, along with a discussion of the occurrence of the *asellus* complex in the northwest of the peninsula.

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MATERIALS AND METHODS

Specimens referred to in this study were collected by hand searching in a number of localities in northwest Spain. Speciemens were collected into 70% ethanol in which they are stored. Type material is deposited in a number of institutions which are referred to in the text with the following abbreviations:

DTB	Coll. D.T. Bilton, Plymouth.
MHNG	Muséum d'Histoire naturelle, Genève.
MZUF	Museo Zoologio dell'Università, Firenze.
NHML	Natural History Museum, London.
USC	University of Santiago de Compostela, Dept. of Biology.

In order to test the reliability of these characters in separating *galicianus* from *asellus* specimens of both species from various localities (Table 1) were scored for the following measurements: total body length, maximum width of pereonite 4, length of lateral lobe, width of lateral lobe at base, length of telson, width of telson projection at base, and width of "respiratory region" on the exopodite of pleopod 1 (Fig. 1). A canonical discriminant functions analysis (REYMENT, BLACKITH & CAMPBELL 1984) was performed on measurements taken, using SPSS 4.0 on a Macintosh LC630 computer, with four groups defined corresponding to the two sexes of the two species.

TABLE I

Specimens of *Oniscus galicianus* sp. nov. and *O. asellus asellus* included in the statistical analysis.

Taxon	Locality	♂♂	♀♀
Oniscus galicianus sp. nov.	SPAIN, Lugo, Rio Pambre	1	
	SPAIN, Lugo, Montes de Valcaloura	1	4
	SPAIN, Lugo, Vilar de Donas	6	
	SPAIN, Lugo, Rio Ferreira	2	3
	SPAIN, Lugo, S. of Meira	1	
	SPAIN, Lugo, Rio Xudan	2	3
	SPAIN, Lugo, Rio Landro	2	2
	SPAIN, Coruña, A Capela Caaveiro	1	
Oniscus asellus asellus	SPAIN, Coruña A Capela Caaveiro	7	
	SPAIN, Asturias, Sierra de los Vientos	2	1
	SPAIN, Pontevedra, Carboeiro	2	2
	SPAIN, Lugo, Baralla	1	
	SPAIN, Lugo, Rio Fereirra	1	2
	SPAIN, Lugo, Vilar de Donas	1	2
	MADEIRA, Fajã Grande de Ca.	1	
	SCOTLAND, Fair Isle	2	
	ENGLAND, Durham. Witten Park	4	

TAXONOMY

Oniscus galicianus sp. nov.

Material examined

Spain, Galicia: 1♂ Holotype, Prov. La Coruña, A Capela Caaveiro. Atlantic *Quercus/Castanea* wood along Rio Eume NE of Pontedeume. D.T. Bilton leg. 6/II/1993. (MZUF). 1♀ paratype, same loc. D.T. Bilton leg. 13/II/1993. (USC). 1♀ paratype, Prov. Lugo, beside Rio Pambre along N547 road, small area of *Quercus* by river. D.T. Bilton leg. 7/II/1993. (DTB). 6♀♀ paratypes, Prov. Lugo, beside Rio Ferreira close to Vilar de Donas along N547 road, small *Quercus* grove beside water. D.T. Bilton leg. 7/II/1993. (2♀♀ MZUF, 4♀♀ DTB). 2♂♂, 3♀♀ paratypes, Prov. Lugo, along Rio Ferreira close to N547-N540 road junction, small grove of *Betula*, *Quercus* and *Castanea* on riverbank. D.T. Bilton leg. 11/II/1993. (1♂, 1♀ MZUF, 1♂, 2♀♀ USC). 3♂♂, 6♀♀ paratypes, Prov. Lugo, E of Palas de Rei, beside N547 road, *Quercus* grove by small stream. D.T. Bilton leg. 11/II/1993. (DTB). 1♂, 4♀♀ paratypes, Prov. Lugo, Montes de Valcaloura 3 km N of Taboada along N540 road, Quercus grove along tiny stream. D.T. Bilton leg. 20/II/1993. (1♂, 1♀ NHML, 3♀♀ DTB). 2♂♂, 3♀♀ paratypes Prov. Lugo, gorge along Rio Xudan NE of Meira, *Quercus* wood with *Saxifraga* and seeps beside stream. D.T. Bilton leg. 21/II/1993. (MHNG). 1♀ paratype, Prov. Lugo, S of Meira along N640 road, *Quercus* grove. D.T. Bilton leg. 21/II/1993. (USC). 3♂♂, 4♀♀ paratypes, 2♀♀ juveniles, Prov. Lugo, 10 km E of Vilar de Donas, *Quercus* grove beside Rio Ferreira along N547 road. D.T. Bilton leg. 14/v/1993. (DTB). 3♂♂, 2♀♀ paratypes, 9♂♂, 12♀♀ specimens, Prov. Lugo, Xerdiz, *Quercus/Castanea* grove beside Rio Landro, under *Rubus* litter and grasses on damp sandy soil. D.T. Bilton leg. 15/v/1990. (Paratypes MZUF, other specimens DTB).

Description

Body (Fig. 2) an elongate flat oval, somewhat parallel-sided over the middle of the pereon. Length 8.8 mm (7.0-13.6 mm in paratypes) maximum width, at pereonite 4, 4-9 mm (3.4 -6.9 in paratypes). Dorsal surface smooth and covered in small triangular tricorns (Holditch 1984) spaced roughly a spine's width apart. Cephalon (from above) twice as broad as long with weak dorsal tuberculation, especially close to the front margins and around the eyes. Frontal lobe obtusely triangular and pointed as in similarly sized *O. asellus*. Lateral lobes shorter than in asellus, almost square-shaped with bluntly-rounded apices. Frontal line as in *asellus*. Eyes each of 18 ocelli. Pereonites 1-3 with posterior borders strongly sinuate at the sides, pereonites 4-7 with posterior borders much more strongly sinuate, sinuation occupying at least the outer two-thirds of segments 4-6 and the entire posterior margin of segment 7. Pereon epimera quite narrow; when viewed from below taking up less than half the total width at segment 4. Apices of epimera sharply pointed,becoming more acuminate on moving down the body. Pleon epimera on segments 3-5 strongly curved and sharply pointed. Telson with a bluntly-pointed projection whose width is half the length of the segment. Telson projection much broader and more rounded than that of *O. asellus*. Uropodal exopod extending beyond the telson by a further projection's length. Last segment of exopod an evenly-curved elongate pointed cylinder slightly flattened dorsoventrally and with a flat outer ventolateral face. Dorsal surface of animal without tuberculation except that surrounding the pale muscle-attachment sites on the pereon, this being particularly marked on the anterior three segments. Colour in alcohol light brownish grey with paler mottling. Cephalon brownish with symmetrically arranged paler spots. Each pereonite with grey-brown base pigment broken by a characteristic pattern of paler areas. Pereonites lacking the greenish yellow areas of "fatty tissue" noted in asellus (BILTON 1994). The pereon is bisected by a pale line above the gut, to each side of which there are a series of longitudinal pale streaks and blotches probably representing areas of muscle attachment. These are more extensive than in typical *asellus asellus*, and resemble the state of development seen in *asellus occidentalis*. These areas are flanked by another pigmented area broken by a pale streak representing the attachment area of the pereopods. Outside this the epimera are again brownish grey, but slightly paler than the rest of the body. The pleon is uniformly brownish grey marked with paler patches each side of the mid-line up to segment 4. In life the colour appears slightly more blue-grey, the animal having a somewhat translucent appearance, and the epimera are often marked with orange- brown spots at their apices. Exopodite of first pleopod characteristic in both sexes (Fig. 1). Shape similar to that of *asellus*, but the outer "respiratory region" (VANDEL 1962) much narrower than in this species, always under 0.3 mm wide.

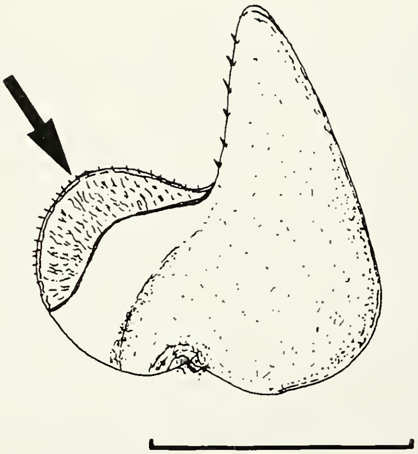


FIG. 1

Oniscus galicianus sp. nov., SPAIN, Lugo, Rio Ferreira. Female first pleopodal exopodite. Arrow indicates area where width of the "respiratory region" was calculated. Scale bar 1 mm.

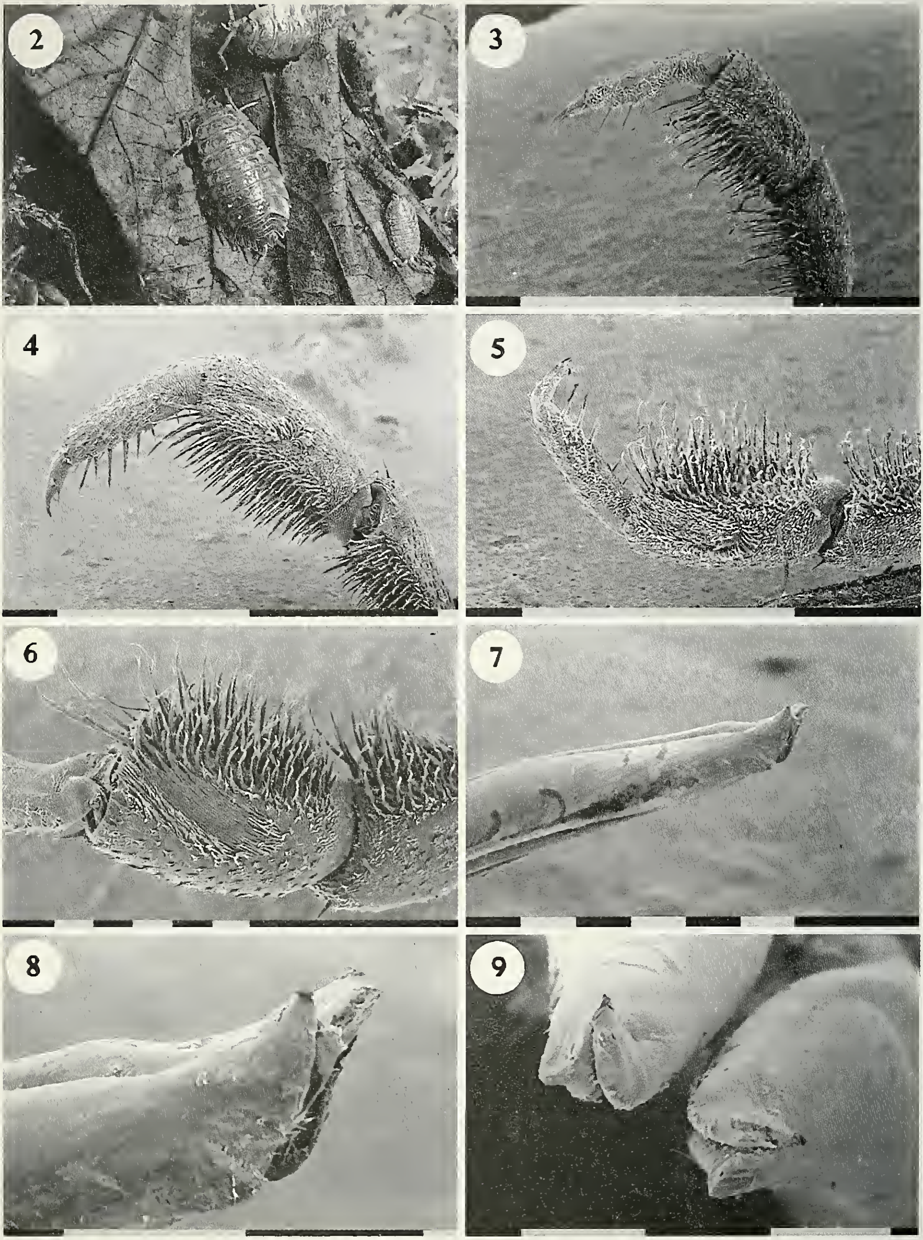
Male

Pereopod 1 with long, somewhat curved spines on the underside of the merus and carpus (Fig. 3). These spines are longer than in *asellus asellus* (Fig. 4) and are of markedly uneven length. The spines appear straighter and less dense than those of *asellus occidentalis* (Fig. 5) or intermediate *asellus* populations (Fig. 6). Carpus with plumose setae on inner face as in asellus s. lat. Endopodite of pleopod 1 appearing swollen dorsally towards the apex (Figs 7 & 8), superficially similar to some individuals of *asellus* s. lat. When seen in apical view (Figs. 9 & 10) the endopodite apex is clearly different to that of any known *asellus* (Figs 11-13). The swelling in *galicianus* is formed by an evenly curved outer dorsolateral ridge, not a more localised bump or projection. This ridge is also clearly distinct from the lateral projection seen in *O. ancarensis* (Fig. 14) from the extreme West of the Cordillera Cantabrica (Bilton 1992).

Recognition of the new species

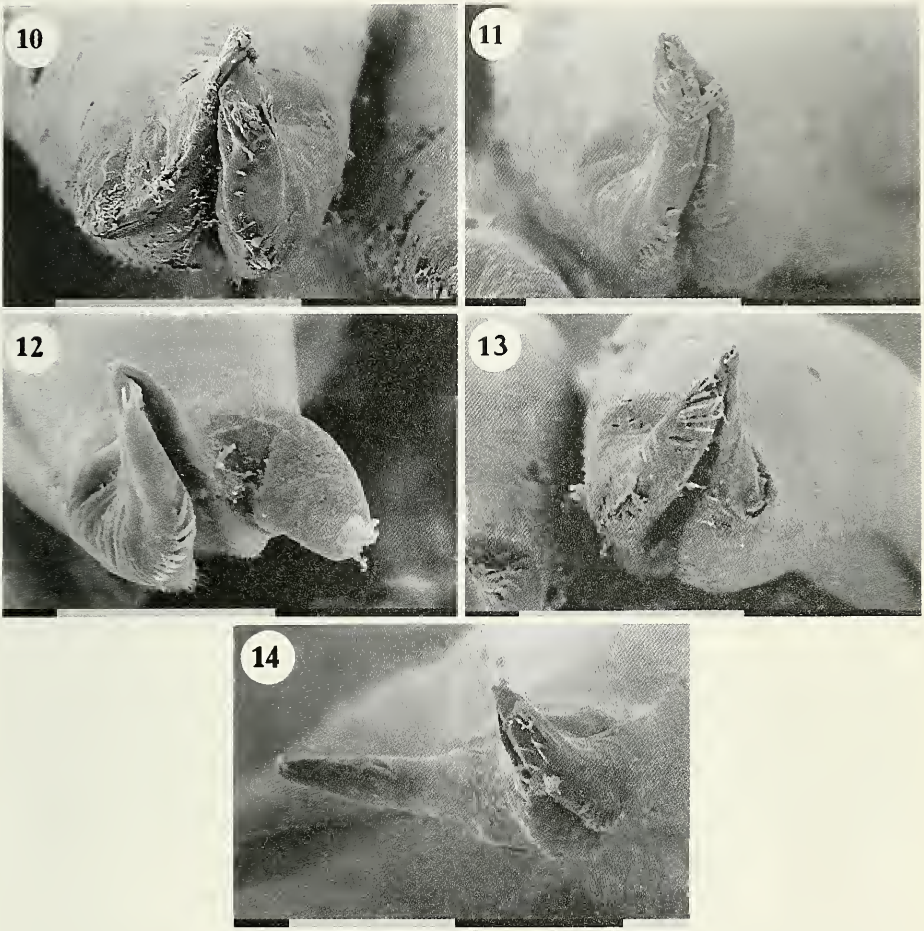
Oniscus galicianus is sympatric with *Oniscus asellus asellus* (sensu Bilton 1994) and *Oniscus lusitanus* Verhoeff. Only *asellus* has been taken in the same sites as *galicianus*, and the two have been found to occupy quite different microhabitats (see below), a fact which first suggested the existence of independent taxa. The new species would key to *Oniscus asellus* in Bilton (1992). The most reliable character for distinguishing *galicianus* from populations of *asellus*, both in Iberia and elsewhere is the width of the "respiratory region" of the first pleopodal exopodite of both sexes. As described this is relatively narrow in the new species, widths of 0.10 - 0.30 ($\bar{X}$ = 0.16) mm being recorded amongst the type series. The width of this area was 0.2 - 0.7 ($\bar{X}$ = 0.39) mm in the sample of *asellus asellus* examined (see below) which included individuals from Iberia and across the species' range. A two-tailed t-test (Sokal & Rolf 1995) indicated that the means of this character are significantly different ($P<0.01$) between the samples of the two species. In addition to the pleopodal exopod, *galicianus* can be distinguished on a number of features. The species can be separated from *O. asellus asellus* by its narrower pereon and shorter and broader frontal lobes and telson. Males can be further recognised by the structure of the apex of the first pleopodal endopodite (Figs 7-10) and the structure of the first pereopods (Fig 3), characters which also allow *galicianus* to be separated from *O. asellus occidentalis* and intermediate *asellus* populations *sensu* Bilton (1994).

In the discriminant functions analysis almost all the variance was explained by the first two discriminant functions which accounted for 72.5 and 24.8% of the total variance respectively. Pooled within-group correlations between measured variables and the discriminant functions are shown in table 2. From the table it is clear that the first discriminant function is mainly a function of "respiratory region" and telson width, whilst the second describes body and lateral lobe shape. The group to which an individual would be predicted to belong based on its discriminant score was compared with its actual group (SPSS, 1983) for each specimen in the analysis, and the results of this reclassification are summarized in table 3. It is immediately evident



FIGS 2-9

2. *Oniscus galicianus* sp. nov., Spain, Lugo, Rio Landro at Xerdiz. Living individual 10mm in length; 3. *Oniscus galicianus* sp. nov., Spain, Lugo. Rio Landro. Male first pereopod, internal face. Scale bar 1 mm.; 4. *Oniscus asellus asellus*, England, Carlisle, Beechgrove. Male first preopod, internal face. Scale bar 1 mm.; 5. *Oniscus asellus occidentalis*, Jersey, Greve de



Figs 10-14

10. *Oniscus galicianus* sp. nov., Spain, Lugo, Rio Landro. Male fist pleopodal endopodites, apical view. Close-up of right pleopod. Scale bar 0.1 mm.; 11. *Oniscus asellus asellus*, England, Carlisle, Beechgrove. Endopodite of male left first pleopod, apical view. Scale bar 0.1 mm.; 12. *Oniscus asellus occidentalis*, England, Devon, Lydford Gorge. Endopodite of male left first pleopod, apical view. Scale bar 0.1 mm.; 13. *Oniscus asellus* intermediate, England, Yorks, Stony Ciffe Wood, Netherton. Endopodite of male left first pleopod, apical view. Scale bar 0.1 mm.; 14. *Oniscus ancarensis*, Spain, Léon, N edge of Priaranza. Endopodite of male left first pleopod, apical view. Scale bar 0.1 mm.

Lecq. Male first pereopod, internal face. Scale bar 1 mm.; 6. *Oniscus asellus* intermediate, England, Wychwood Forest. Male first pereopod, internal face. Scale bar 1mm.; 7. *Oniscus galicianus* sp. nov., Spain, Lugo, Rio Landro. Endopodites of male first pleopods, lateral view. Scale bar 0.1 mm.; 8. *Oniscus galicianus* sp. nov., Spain, Lugo, Rio Landro. Close-up of apices of male first pleopodal endopodites. Scale bar 0.1mm.; 9. *Oniscus galicianus* sp. nov., Spain, Lugo, Rio Landro. Male first pleopodal endopodites, apical view. Scale bar 0.1mm.

that all *asellus* individuals are correctly classified with this species, indeed only 9.5% of females being misclassified at all, as males of the same species. In the case of *galicianus* some individuals of both sexes could be misclassified with *asellus*, but in this taxon 83% of females and almost 94% of males would be correctly placed, indicating the value of the chosen characters in distinguishing the two taxa.

DISCUSSION

The description of *galicianus* increases the number of *Oniscus* species to five. All except the widespread European *O. asellus* s. lat. are restricted to the Iberian peninsula and adjacent southwest Europe. Three species, *ancarensis*, *lusitanus* and *galicianus* are endemic to the extreme west of the peninsula. *O. ancarensis* has been taken from the Sierra de Ancares and adjacent areas in the Galician west of the Cantabrian mountains, where it can be found sparingly in wet *Quercus* and *Castanea* woods (pers. obs.). From available information this species appears to be allopatric to all other *Oniscus*, not even *asellus* having been found in this area. It appears that *ancarensis* is endemic to the end of the Cantabrian chain, finds being restricted to Ancares, Serra do Courel and nearby regions on the Lugo-Léon border. *O. lusitanus* has a distribution ranging from central Portugal to Asturias (BILTON 1992; SCHMILZER 1971). The species is most abundant in the extreme north of Portugal and the south of Galicia in Pontevedra province, and appears to be more thermophilous than other members of the genus. In the north and east of its range *lusitanus* becomes very scarce, and has not so far been taken in the colder region of central Lugo where most *galicianus* localities are situated. *O. galicianus* then co-occurs only with *O. asellus*. The ecology of these two species in the region is quite different however, and this is examined below along with a discussion of *O. asellus* in the northwest of Iberia.

TABLE 2

2. Pooled within-group correlations between measured variables and the first two discriminant functions. An asterisk (*) indicates a significant association at the 0.1 level. Variables are as follows: total body length (1), max. width of pereonite 4 (2), length of lateral lobe (3), width of lateral lobe (4), length of telson (5), width of telson projection at base (6), and width of "respiratory region" on first pleopodal exopodite (7).

	Discriminant function	
Variable	1	2
7	0.71461*	0.44691
5	0.54467*	0.37630
2	0.43243	0.72722*
3	0.38950	0.58136*
1	0.30154	0.51260*
6	0.38555	0.47206*
4	0.22917	0.22399

TABLE 3

Summary table of actual and predicted group membership (based on discriminant scores) for *galicianus* and *asellus* specimens measured in the analysis.

ACTUAL GROUP		NO. OF CASES	PREDICTED GROUP MEMBERSHIP 1	2	3	4
asellus ♂	1	21	19 90.5%	2 9.5%	0 0.0%	0 0.0%
asellus ♀	2	7	0 0.0%	7 100.0%	0 0.0%	0 0.0%
galicianus ♀	3	12	2 16.7%	0 0.0%	7 58.3%	3 25.0%
galicianus ♂	4	16	0 0.0%	1 6.2%	4 25.0%	11 68.8%

ECOLOGICAL SEPARATION OF *asellus* AND *galicianus*

Oniscus galicianus has so far been reported from 10 localities in central Galicia, in the provinces of La Coruña and Lugo. The species' distribution is centred on the medium altitude areas of central Lugo, around the town of Melide, extending north to the Rio Landro basin and west to the Eume valley. Despite exhaustive fieldwork in adjacent areas of Galicia, Léon, Asturias and northern Portugal *galicianus* has not been taken outside this small area, and genuinely appears to be restricted to this part of Galicia. In comparison with surrounding areas central Lugo experiences a harsher climate, with cold fog frequently enveloping the landscape for most of the day during Autumn and Winter.

Oniscus asellus has also been taken in this region, indeed the species co-occurred with *galicianus* at 60% of localities. Where the two woodlice were found together it was clear that they occupied quite separate microhabitats. *O. asellus* was found in microsites typical of this species throughout its range; below bark of fallen trees, and under dead logs. In contrast *galicianus* was never found associated with timber, being taken in leaf litter or amongst damp soil. All the microsites from which the species was collected were extremely wet, usually being immediately adjacent to flowing watercourses, or actually within small seepages. On one occasion specimens were collected under trickling water beside a small waterfall (A Capela Caaveiro). On two occasions *O. galicianus* was collected together with *Miktoniscus bisetosus* Vandel, 1946, a trichoniscid of saturated organic soil beside small streams. The reduced size of the "respiratory region" compared to *asellus* may be relevant here, since *galicianus* is tied to wetter microsites than other *Oniscus*, being almost amphibious.

SYSTEMATIC PLACEMENT OF *galicianus* AND THE OCCURRENCE OF THE *asellus* COMPLEX IN NORTHWESTERN IBERIA

It is clear that galicianus is very closely related to *asellus* and *ancarensis*. These three species appear to form a distinct clade within *Oniscus* (here referred to as the *asellus* complex), defined by a smooth dorsal surface in adults and (except in *O. asellus asellus*) a complex structure to the apices of the endopodites of the first male pleopods.

Whilst *ancarensis* and *galicianus* are localized endemic species restricted to the extreme northwest of Spain, *asellus* occurs widely in Europe and has been divided into two distinct subspecies (*asellus* and *occidentalis*) which appear to hybridise extensively (Bilton, 1994). As noted earlier previous records of hybrid individuals from Galicia, which led to the suggestion that both subspecies of *asellus* must be present in northern Iberia, are in fact referrable to *galicianus*. All *asellus* material seen from Spain and Portugal belongs to the widespread nominate subspecies. The nearest *occidentalis* appears to get to the Iberian peninsula is the French east Pyrenees (BILTON 1994). Given the extensive fieldwork conducted by the author in 1993 it appears likely that *occidentalis* is truly absent from Iberia. This absence is quite unexpected, and alters considerably hypotheses regarding the differentiation of *asellus* and *occidentalis*. BILTON (1994) considered that the taxa diverged in the Iberian peninsula as a result of climatic fluctuations and habitat shift during the Pleistocene. Such a scenario demands that *asellus* and *occidentalis* coexisted in Iberia during some time in the recent past, an idea which was supported by the supposed hybrid individuals from Galicia. Now it is clear that only *asellus* s.str. is found in Iberia it seems more likely that the split into two taxa occurred elsewhere, since there is no good climatic or ecological reason for the absence of *occidentalis* from the area. *O. a.occidentalis* is restricted to the British Isles and western France and assuming that its differentiation from *asellus* occurred as a result of isolation in separate refugia during Pleistocene climatic cycles such refugia could be postulated to have been situated in Southern France, an area known for its high diversity of endemic isopods which have apparently differentiated *in situ* (VANDEL 1960; 1962). Under such a scenario Iberian populations of *asellus* could be seen as Postglacial invaders, rather than the source from which the species expanded in the Holocene. Genetic phylogeographical studies of extant populations of this complex will be invaluable if we are to understand its evolution and spread in Europe and the implications this may have to Pleistocene biogeography..

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Jumping plant-lice of the New World genus *Calinda* (Hemiptera: Psylloidea: Triozidae). - The genus *Calinda* is removed from synonymy with *Trioza* and is redefined based on adult and larval characters. Its 50 constituent species, 36 of which are new, are described and illustrated. Keys are provided for males, females and fifth instar larvae. Lectotypes are designated for 3 species. The taxonomic relationships of 7 morphologically similar Argentine and Chilean species are investigated using morphometric methods. Members of the genus are associated with *Baccharis* s. l. (*Baccharis* s. str., *Neomolina* and *Pingraea*), *Senecio* and *Pentacalia* spp. (Asteraceae). The larvae are monophagous or narrowly oligophagous and induce galls in the flower heads or on the shoots. The genus is most species-rich in and along the Andes (Ecuador, Peru, Chile).

Key-words: Hemiptera - Psylloidea - Asteraceae - *Baccharis* s. l. - *Senecio* - Neotropical - Nearctic - Taxonomy.

INTRODUCTION

Baccharis (including *Neomolina* and *Pingraea*) is an asteraceous genus of woody dioecious shrubs of up to 4 m height. With some 400 to 500 species it is the largest genus within the tribe Astereae (BREMER 1994; MALAGARRIGA 1976). The bulk of the species occurs in South America with about 20 species reaching the Southern United States. *Baccharis halimifolia* was introduced into Europe and Australia, possibly as an ornamental. Several species have pest status; apart from invading pasture and park land, they are toxic to livestock. *Baccharis halimifolia*, *B. neglecta* and *B. salicifolia* cause serious economic weed problems in the Southern United States. The last one is a phreatophyte wasting valuable water in the dry Southwestern United States. On the other hand several species are beneficial to man as ornamentals, for providing food to honey bees, in controlling erosion or for use in the reclamation of copper mine waste areas, in providing commercial fragrances or an array of chemicals used for medicinal purposes, including anti-cancer drugs (BOLDT 1989).

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Baccharis s. l. hosts a variety of insects many of which are specialised to it. HOUARD (1933) lists the Central and South American gall forming species (for psylloids see table 1), and BOLDT & ROBBINS (1987, 1990, 1994), BOLDT *et al.* (1988) and BOLDT (1989) record phytophagous insects on North American taxa. Several species of the hemipterous jumping plant-lice or Psylloidea are restricted to *Baccharis* (HODKINSON & WHITE 1981; BURCKHARDT 1987a, 1988; HODKINSON 1988; BOLDT *et al.*, 1988; BOLDT & ROBBINS 1990, 1994; ARAUJO *et al.*, 1995) (cf. Tables 1, 2, 3). Most of them are gall formers on the leaves, shoots or in the flower heads. Apart from a few Psyllidae: Aphalaroidinae (*Neopelma* and *Russelliana* spp.) (table 2), the species belong to the Triozidae and, in particular, to the *Trioza hastata* (table 2) and *baccharidis* (table 3) groups (BURCKHARDT 1988). The former includes three South temperate neotropical species which are treated by BURCKHARDT (1988). The latter, in contrast, is species-rich with a long and confusing taxonomic history (see below).

The present paper reviews the taxonomy of the *Trioza baccharidis* group which is referred here to the genus *Calinda*. In particular the problem of morphological variation within and among populations is addressed. Qualitative morphological and morphometric techniques are employed and compared with host ranges. It is found that, apart from *Baccharis* s. l., also *Senecio* and *Pentacalia* spp. are utilised as hosts. The aim of the present revision is two-fold: 1. to record and describe parts of the planet's biodiversity; 2. to provide a sound taxonomic base for a group of insects of potential economic interest as control agents of weeds and as pests of plants of interest to man.

TABLE 1

Unidentified psylloid spp. inducing galls on *Baccharis* s. l. listed by HOUARD (1933). The list contains the gall number of HOUARD (1933), the plant name (nomenclature of Houard), the gall type, the provenience, and comments.

1176 - *Baccharis aphylla* DC.; shoot gall; Brazil. Comment: described by TAVARES (1917) the gall shape is similar to that of *Neopelma baccharidis*.

1203 - *Baccharis salicifolia* Pers.; leaf gall; Argentina. Comment: this gall, which was recorded by KIEFFER & JÖRGENSEN (1910), DEL GUERCIO (1913), TAVARES (1915) and JÖRGENSEN (1917), is referrable to *Trioza steinbachi*.

1214 - *Baccharis confertifolia* Colla (= *Pingraea salicifolia*); leaf gall; Chile. Comments: KIEFFER & HERBST (1911) described *Trioza* (?) *baccharis* based on galls and larvae from Valparaiso. Their description conforms with galls and larvae of *Trioza hastata* and *T. tergobscura* which both were collected in the area on the same host-species (MHNG data). As the type material is destroyed and the description insufficient to associate the name without doubt to either species, we follow BURCKHARDT (1988) and treat *Trioza* (?) *baccharis* as a nomen dubium.

1228 - *Baccharis rosmarinifolia* Hook. & Arn.; leaf gall; Chile. Comment: this gall was attributed to an aphid or psylloid (KIEFFER & HERBST 1909).

1232 - *Baccharis* sp.; leaf gall; Brazil. Comment: questionably referred to a psylloid (TAVARES 1917).

1240 - *Baccharis* sp.; flower bud galls; Brazil. Comment: RÜBSAAMEN (1907) mentions larvae which may correspond to those of *Neopelma baccharidis*.

1247 - *Baccharis* sp.; leaf galls; Brazil. This spherical gall described by TAVARES (1922) may be induced by *Neopelma baccharidis*.

1254 - ?*Baccharis* sp.; leaf galls; Brazil. Comment: it is doubtful whether this gall is produced by psylloids as has been provisionally suggested by TAVARES (1917).

TABLE 2

Psylloid species, other than *Calinda*, associated with *Baccharis* s. l. with data on distribution, host-plants and references.

Psylloid species	Distribution	Host-plants	Reference
Bactericera rubra (Tuthill, 1939)	Mexico, U. S. A. (Arizona, Colorado, New Mexico, Oregon)	*Baccharis* sp.	BURCKHARDT & LAUTERER 1996
Trioza renarsa Tuthill, 1959	Peru	?*Baccharis* sp.	TUTHILL 1959
Trioza hastata Burckhardt, 1988	Chile	*Pingraea salicifolia*	MHNG data
Trioza tergobscura Burckhardt, 1988	Argentina, Chile	*Pingraea salicifolia*	MHNG data
Trioza steinbachi Burckhardt, 1988	Argentina	*Pingraea salicifolia*	DEL GUERCIO 1914 MHNG data
Neopelma baccharidis Burckhardt, 1987	Argentina, Brazil, Chile, Paraguay	*Baccharis linearis*, *B. dracunculifolia*	BURCKHARDT 1987a; ARAUJO *et al.* 1995; MHNG data
Russelliana intermedia Burckhardt, 1987	Argentina, Bolivia, Chile	*Baccharis linearis*, *B. magellanica*, *B. mylodontis*, *B. zoellneri*, *Neomolina paniculata*, *Pingraea salicifolia*, *P. viscosa*	MHNG data
Russelliana cf. *solanicola* Tuthill, 1959	Chile	*Baccharis neaei*, *B. zoellneri*	MHNG data

TABLE 3

Checklist of *Calinda* spp. with data on distribution and host-plants.

Calinda species	Distribution	Host-plants
aguilari	Peru	*Baccharis* sp.
albonigra	Ecuador	unknown
ambigua	Argentina, Chile	*Baccharis* x *concava*, *B. linearis*, *B. mylodontis*, *B. neaei*, *B.* sp.
antucana	Chile	*Baccharis patagonica* ssp. *palenae*, *B.* sp.
araucana	Argentina, Chile	*Baccharis elaeoides*, *B. lycioides*, *B. obovata* ssp. *obovata*, *B. zoellneri* ssp. *minor*, ssp. *zoellneri*, *B.* sp.
baccharidis	Peru	*Baccharis lanceolata*
beingoleai	Peru	*Baccharis floribunda*
boldti	Chile	*Baccharis linearis*, *B.* sp., *Neomolina paniculata*

branisai	Bolivia	unknown
brevicauda	Ecuador	unknown
broomfieldi	Peru	unknown
chionophili	Chile	*Senecio chionophilus*
collaris	U. S. A.	*Pingraea salicifolia*
falciforceps	Ecuador	unknown
fumipennis	U. S. A.	*Baccharis* sp.
gibbosa	Cuba, Colombia, Ecuador, Peru, Venezuela	*Baccharis floribunda*, *B.* sp.
gladiformis	Ecuador, Peru	unknown
graciliforceps	Mexico, U. S. A.	*Baccharis* sp.
hodkinsoni	Argentina	unknown
hollisi	Costa Rica	*Baccharis trinervis*, *B.* sp.
huggerti	Ecuador	unknown
inca	Peru	unknown
jibara	Ecuador	unknown
longicaudata	Mexico, U. S. A.	*Neomolina pteronioides*
longicollis	Ecuador	unknown
longistylus	U. S. A.	*Baccharis salicina*, *Pingraea salicifolia*
magniforceps	Peru	*Baccharis* sp.
mendocina	Argentina	*Pingraea salicifolia*
microcephala	Ecuador	unknown
muiscas	Peru	unknown
osorii	Colombia	unknown
otavalo	Ecuador	unknown
panamensis	Costa Rica, Panama	*Pentacalia andicola*
parviceps	Peru	*Senecio rudbeckiafolius*
patagonica	Chile	*Senecio patagonicus*
pehuenche	Chile	*Pingraea salicifolia*
penai	Chile	*Baccharis* sp.
peruana	Peru	*Baccharis* sp.
peterseni	Chile	*Senecio tricuspidatus*
plaumanni	Brazil	unknown
proximata	Mexico	unknown
reversyi	Bolivia	unknown
salicifoliae	Chile	*Pingraea salicifolia*
simoni	Peru	*Baccharis* sp.
spatulata	Ecuador	unknown
testacea	Chile	*Pingraea sphaerocephala*
trinervis	Costa Rica, Panama	*Baccharis trinervis*
tuthilli	Peru	unknown
velardei	Peru	*Baccharis humifusa*
yungas	Ecuador	unknown

MATERIAL AND METHODS

Type material was examined of species described by Blanchard (1852) (Burckhardt 1986, 1988) (MNHN), Crawford (1910a, 1911) (USNM), Tuthill (1959, 1964) (USNM) and Brown & Hodkinson (1988) (USNM). Original material of Kieffer & Jörgensen (1910) and Kieffer & Herbst (1911) was unavailable for examination and is probably destroyed (Burckhardt 1987a). Major sources of fresh material were recent collections from Chile by D. Hollis (BMNH) and by the authors (MHNG, NHMB); from Ecuador by L. Huggert (MZLU); from Costa Rica by P.

Hanson and D. Hollis (BMNH); and from the Unites States by P. E. Boldt and collaborators (USNM). Additional specimens were examined from a variety of institutions. Material is mentioned from following institutions:

BMNH	The Natural History Museum, London, UK;
FMLT	Fundación Miguel Lillo, Tucumán, Argentina;
HMNH	Hungarian Museum of Natural History, Budapest, Hungary;
IZAV	Instituto de Zoología Agrícola, Facultad de Agronomía, Universidad Central de Venezuela, Maracay, Aragua, Venezuela;
MHNG	Muséum d'histoire naturelle, Geneva, Switzerland;
MNHN	Muséum National d'Histoire Naturelle, Paris, France;
MNNC	Museo Nacional de Historia Natural, Santiago, Chile;
MZLU	Museum of Zoology, Lund University, Lund, Sweden;
NHMB	Naturhistorisches Museum, Basel, Switzerland;
NMHU	Naturhistorisches Museum der Humboldt Universität, Berlin, Germany;
USNM	National Museum of Natural History, Washington, D.C. (psylloid collection deposited in the USDA, Beltsville, MD), U.S.A.

Morphological terminology is as in figs 1 and 2, and follows mostly HOLLIS (1984), BROWN & HODKINSON (1988) and OSSIANNILSSON (1992). Measurements are taken as indicated in figs 1 and 2. The following abbreviations are used in the morphometric analyses, the keys and the descriptions:

a/b	m_1 cell value
AL	antenna length (including scape, pedicel and terminal setae)
ALHW	antenna length / head width ratio
c/d	cu_1 cell value
CPR	circumanal ring length
FP	female proctiger length
FPC	female proctiger / circumanal ring length ratio
FPHW	female proctiger length / head width ratio
FSP	female proctiger / subgenital plate length ratio
HW	head width
L3/L4	antennal segment 3 / segment 4 length ratio
LL	length of apical two labial segments
LLHW	length of apical two labial segments / head width ratio
SS	length of shorter terminal antennal seta
TL	metatibia length
TLHW	metatibia length / head width ratio
LS	length of longer terminal antennal seta
MP	male proctiger length
MPHW	male proctiger length / head width ratio
PL	paramere length
WL	forewing length
WLHW	forewing length / head width ratio
WLW	forewing length / width ratio
WW	forewing width

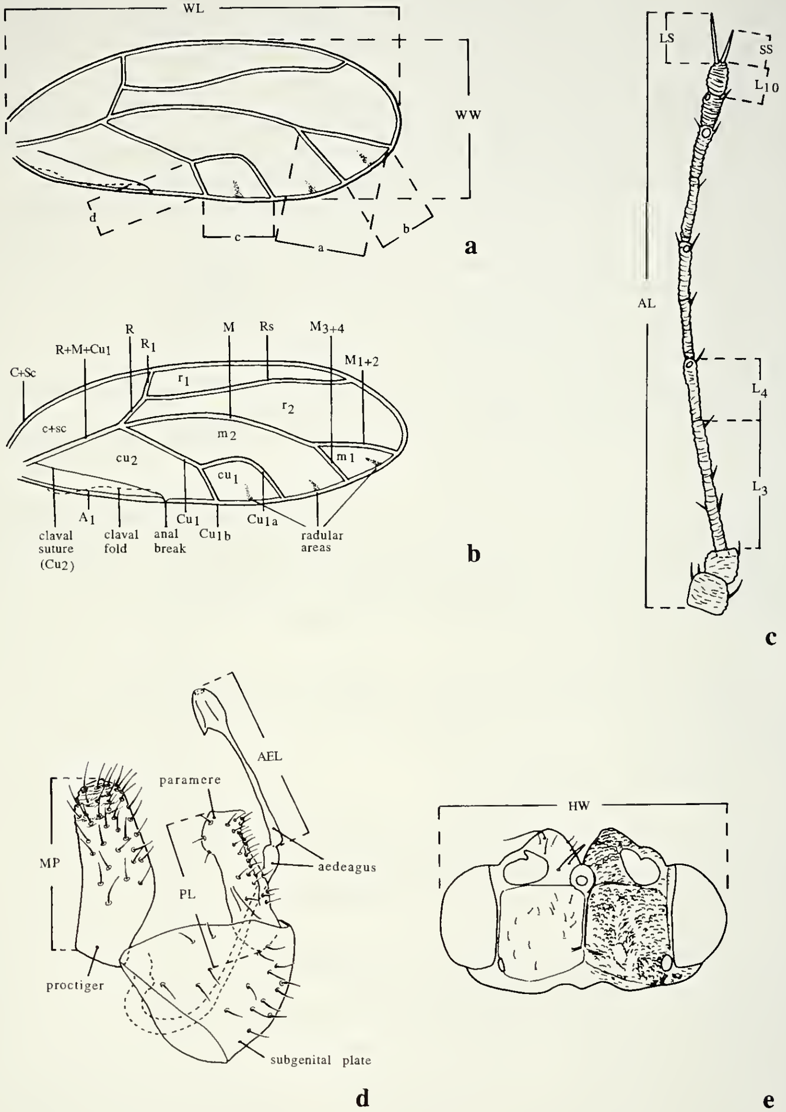

FIG. 1

Calinda spp., morphology and measurements (for explanations of abbreviations see in material and methods). a: *C. longicaudata* sp. n.; b: *C. beingoleai* (Tuthill); c, e: *C. testacea* Blanchard; d: *C. peterseni* sp. n. a: forewing showing measurement nomenclature; b: forewing showing cell nomenclature; c: antenna; d: male genitalia; e: head, dorsal view.

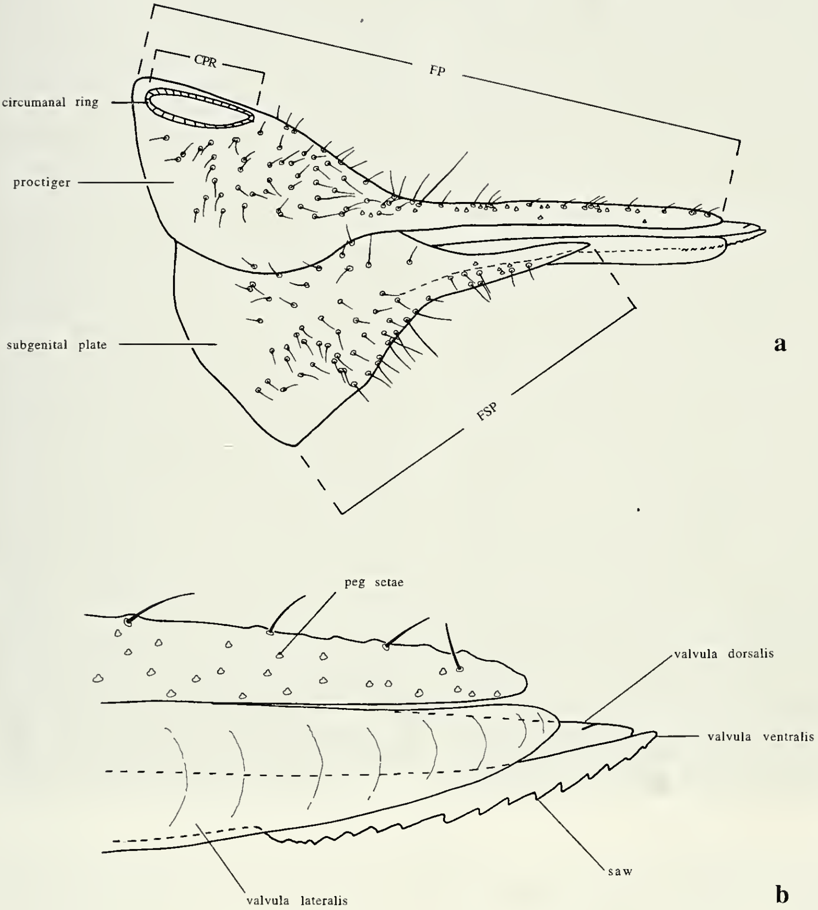

FIG. 2

Calinda araucana sp. n., morphology and measurements. a: female genitalia, in profile; b: details of valvulae.

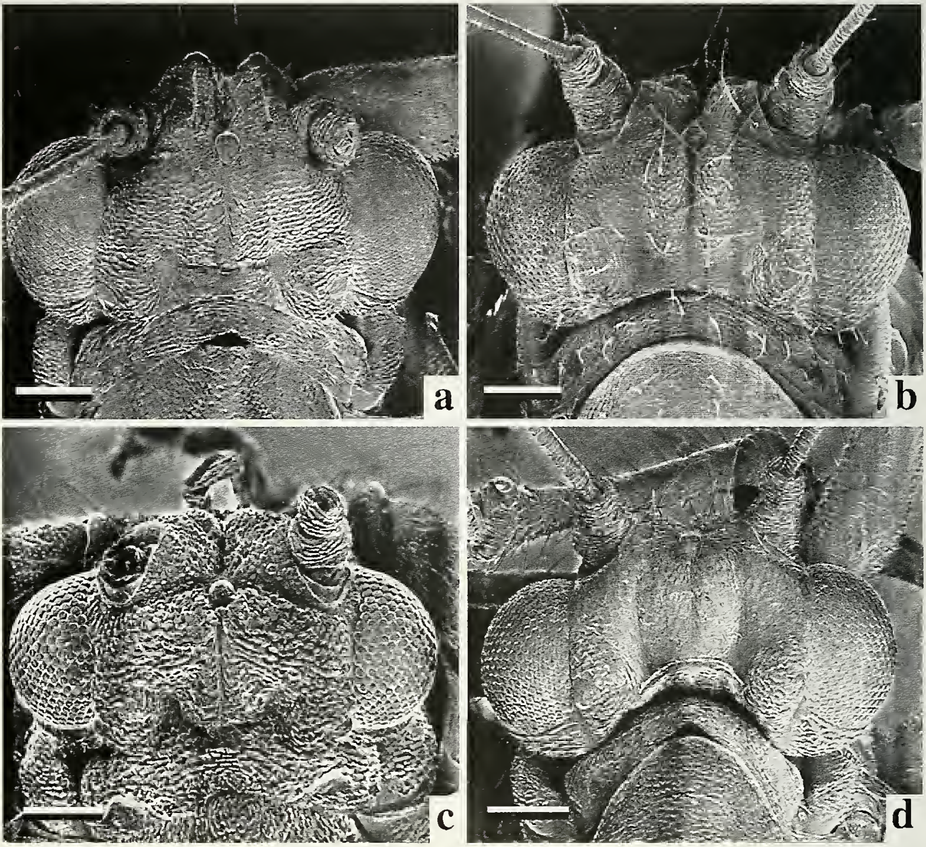

FIG. 3

Calinda spp., head, dorsal view. a: *C. longistylus* (Crawford); b: *C. panamensis* (Brown & Hodkinson); c: *C. peterseni* sp. n.; d: *C. testacea* Blanchard. Scale lines = 100 µm.

In the material examined sections the plant names are cited as indicated on the labels. In the host-plant sections the generic concepts of HELLWIG (1993) are adopted with synonymies which were kindly suggested by F. Hellwig (pers. comm.). In cases of discrepancies the original label data are added in parentheses. Host identifications of material collected by D. Hollis and D. Burckhardt were made by F. Hellwig.

Drawings and measurements were made from slide mounted specimens. The descriptions were produced with the software DELTA (DALLWITZ *et al.* 1993). For the morphometric analyses we used the software ADE 4.0 (DOLÉDEC *et al.* 1995).

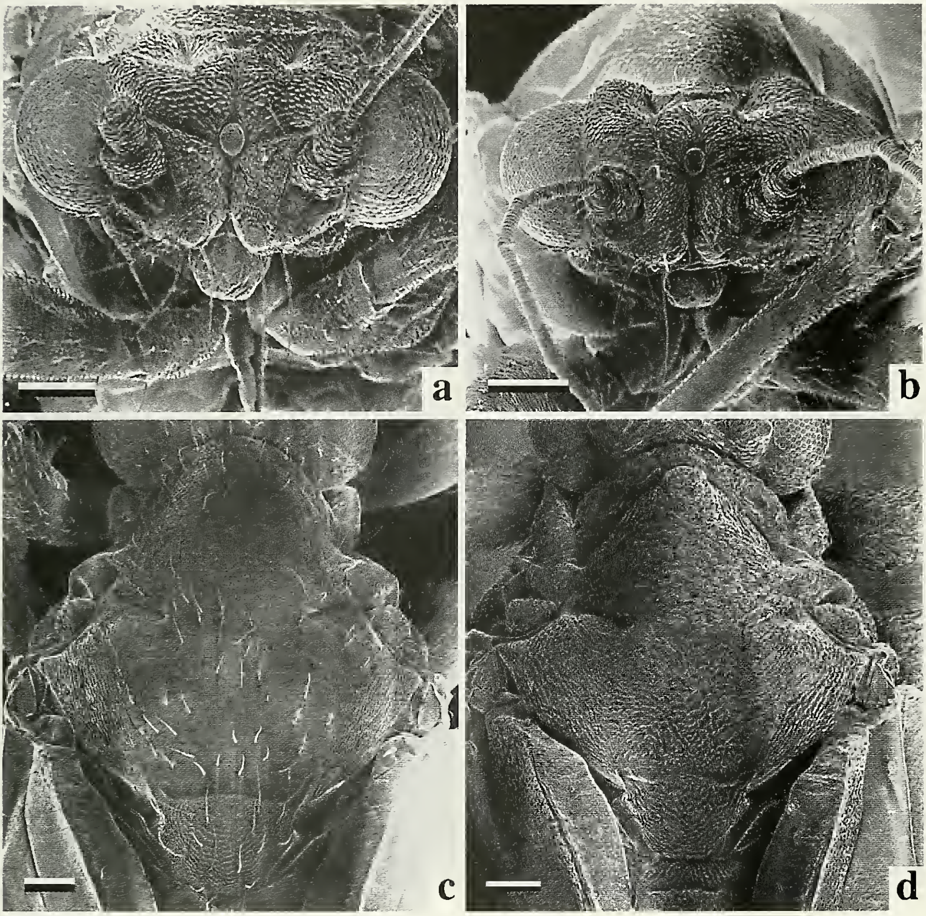

FIG. 4

Calinda spp. a-b: head, frontal view; c-d: thorax, dorsal view. a: *C. longistylus* (Crawford); b: *C. testacea* Blanchard; c: *C. panamensis* (Brown & Hodkinson); d: *C. peterseni* sp. n. Scale lines = 100 µm.

TAXONOMIC HISTORY

The oldest publication treating neotropical psylloids is a paper by BLANCHARD (1852) describing 18 species in the genera *Psylla* (4 spp.), *Calinda* (8 spp.), *Delina* (5 spp.) and *Sphinia* (1 sp.) from Chile. Despite its fundamental character the paper was largely ignored for the following 135 years. BURCKHARDT (1986, 1987a, 1987b, 1988) revised Blanchard's collection (MNHN) in the context of taxonomical work on temperate Neotropical psylloids. BURCKHARDT (1988) designated *Calinda testacea* as type species of *Calinda* and synonymised the taxon with the large, artificial genus *Trioza*. In addition he synonymised *C. nigromaculata* with *C. testacea*, the former

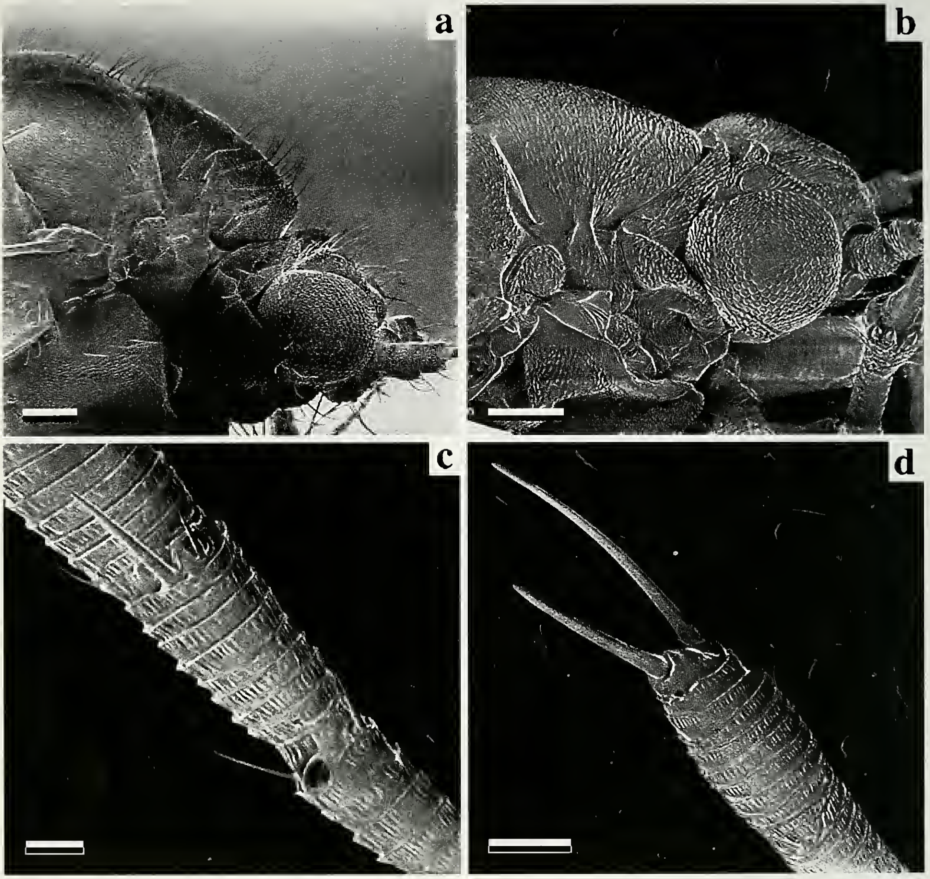

FIG. 5

Calinda spp. a-b: thorax, lateral view, scale lines = 100 µm; c: antennal segments 8 and 9 with rhinaria, scale line = 10 µm; d: antennal segment 10 with terminal setae, scale line = 20 µm. a: *C. panamensis* (Brown & Hodkinson); b-d: *C. testacea* Blanchard.

representing the female of the latter. The other species referred to *Calinda* by BLANCHARD (1852) belong to other groups (BURCKHARDT 1986).

Cecidotrioza mendocina was described by KIEFFER & JÖRGENSEN (1910) from material collected on *Baccharis salicifolia* (= *Pingraea salicifolia*) near Mendoza, Argentina. HODKINSON & WHITE (1981) suggested that this species may be congeneric with other *Baccharis* feeding species, and BURCKHARDT (1988) synonymised it with *Trioza testacea*.

CRAWFORD (1910a, b, 1911) described *Trioza collaris*, *longistylus* and *proximata* from the United States and Mexico. Subsequently they were recorded from many additional localities (HODKINSON & WHITE 1981; HODKINSON 1988). TUTHILL

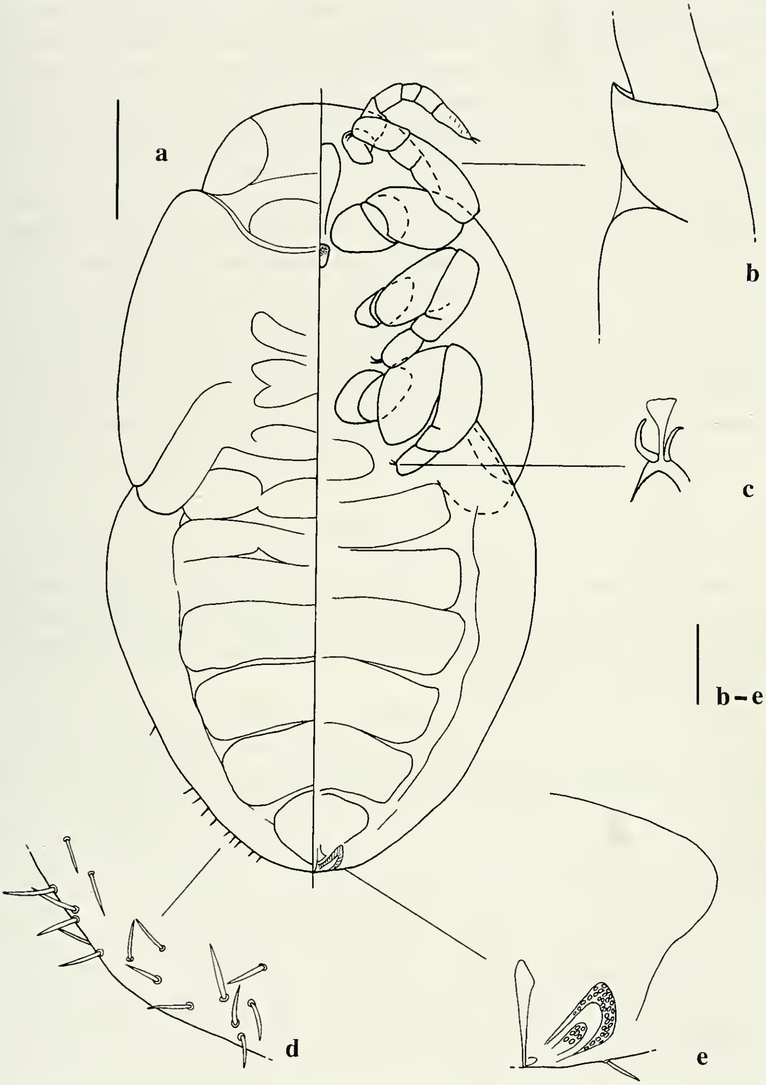

FIG. 6

C. testacea Blanchard, fifth instar larva. a: left, dorsal face, right, ventral face, scale line = 0.3 mm; b: apex of tibio-tarsus; c: tarsal arolium and claws; d: caudal abdominal setae; e: circumanal ring; scale lines b-e = 0.05 mm.

(1944) suggested that specimens of *T. longistylus* are not specifically distinct from *T. collaris* and synonymised the two. He further stated that it is impossible to separate the males of *T. collaris* and *proximata*. The illustrations of the female genitalia of *T. proximata* by CRAWFORD (1914) differ significantly from those by TUTHILL (1943), suggesting that the two authors dealt with different species. Records in the literature are, therefore, not reliable. Recently BOLDT *et al.* (1988) and BOLDT & ROBBINS (1990, 1994) recorded psylloids from several *Baccharis* spp. under the name *T. collaris*.

TUTHILL (1959, 1964) defined the *Trioza baccharidis* group and described nine species from Peru, for some of which he also indicated host-plants. BROWN & HODKINSON (1988) described one and reported another undescribed species from Panama. BURCKHARDT (1988) redefined the *T. baccharidis* group and referred South temperate neotropical material to previously described species. He concluded that members of the group have a very homogenous morphology and, with the limited material at hand at that time, it was difficult to assign specimens to known species.

QUALITATIVE TAXONOMIC CHARACTERS

As outlined above, it is difficult to identify *Calinda* species with existing literature sources as the variation of morphological characters within and among populations is largely unknown. To address this problem both a qualitative and a quantitative approach was selected.

To examine the variability of qualitative taxonomic characters, we studied the variation within populations, i. e. among specimens coming from the same locality and the same host species, e. g. specimens from Chile on *Pingraea sphaerocephala* (= *C. testacea*), on *P. salicifolia* (= *C. salicifoliae*) and on *Senecio tricuspidatus* (= *C. peterseni*) or from Mexico and the U. S. A. on *Neomolina pteronioides* (= *C. longicaudata*) and on *Pingraea salicifolia* (= *C. collaris*). Based on the comparison of these populations we found several stable characters concerning the detailed structure of the male and female genitalia as well as, though to a lesser extent, the forewing shape and colour (cf. species descriptions). The next step was to apply these character sets to all Chilean and North American material and then extend it to the entire fauna. Looking at the host plants, we found that species are either monophagous or narrowly oligophagous (Table 3), a pattern which is to be expected in psylloids.

QUANTITATIVE (MORPHOMETRIC) CHARACTERS

The morphological differences between seven Argentine and Chilean species centred around *C. testacea* are particularly small. The species complex is defined by the tubular, posteriorly weakly produced male proctiger, the long, slender, apically truncate paramere with many thick spines on the inner face, and the female proctiger with a long apical process bearing irregularly spaced peg setae. To confirm the distinctness of these species and to find additional characters to separate them, we performed two types of morphometric analyses, as this has been done successfully in other groups of insects (FOOTTIT 1992; GARRISON 1992). The following species are treated: *C. ambigua* (♂ = 18, ♀ = 14), *C. antucana* (♂ = 3, ♀ = 4), *C. araucana* (♂ = 15, ♀ = 14), *C. boldti* (♂ = 4, ♀ = 4), *C. mendocina* (♂ = 4, ♀ = 3), *C. pehuenche* (♂ = 12, ♀ = 10), and *C. testacea* (♂ = 15, ♀ = 12), totalling 71 ♂ and 61 ♀. Due to insufficient larval material only adult characters were taken into consideration. Males and female were treated separately.

The characters (= variables) chosen for the analysis (18 for ♂, 19 for ♀) are detailed in the "Material and methods" section, in figs 1 and 2, and in appendices 1 and 2. In some specimens not all structures were measurable (e. g. broken antennae). To include all specimens, missing data were calculated from a correlation matrix with a linear regression. To avoid weighting data *a priori*, only gross values were used (JACKSON & SOMMERS 1991; YOCCOZ 1993) rather than fractions. With a correlation matrix highly correlated variables were eliminated which left 10 characters for ♂ and 12 for ♀.

Two types of multivariate analyses were performed: Principal Component Analysis (PCA) and Discriminant Function Analysis (DFA). The first analysis does not assume *a priori* groupings of the taxonomic units but concentrates on the relation between the variables and the individual (FOOTTIT & SORENSEN 1992). In contrast the DFA presumes an *a priori* grouping and calculates the best separation between the taxonomic units.

ANALYSES OF MALES

From the original 18 characters, 10 were retained for the analyses: *HW*, *WL*, *WW*, *a*, *b*, *c*, *d*, *MP*, *PL* and *AEL*.

The first analysis is a PCA for centred data (fig. 7). With three axis (eigenvectors) (F1, F2, F3), most of the variation can be explained (fig. 7b, d) (ATCHLEY *et al.* 1976; CRISCI & LOPEZ 1983; FOOTTIT & SORENSEN 1992). In our analysis 63% of the variation is in F1, and most of this corresponds to size. *C. araucana* is well-separated from the other species with the exception of *C. ambigua* which includes small and large-sized individuals. Two variables are not associated with size (*AEL* and *PL*) (fig. 7c, e); they show on F2 (15 % variation); F2 separates *C. ambigua* into two groups.

The PCA for doubly centred data (fig. 8) eliminates mostly the size effect. In our example it resembles the PCA for centred data but groups *C. ambigua* together (fig. 8b). Excluding *C. ambigua*, *C. antucana* and *C. araucana* are well-separated but the other species overlap on F1 and F2 (48% variation) (variables *AEL*, *MP*, *a*, *b*, *c*, *d*). On F2 (14 % variation) and F3 (11 % variation) *C. antucana* and *C. boldti* are separated by the variables *b*, *c*, *d* and *MP* (fig. 8d, e).

In the DFA (fig. 9) the species are well-separated on F1 (33 % variation) (fig. 9b) by the variables *a*, *c*, *AEL* and *WL*. On F2 (31 % variation) and F3 (18 %

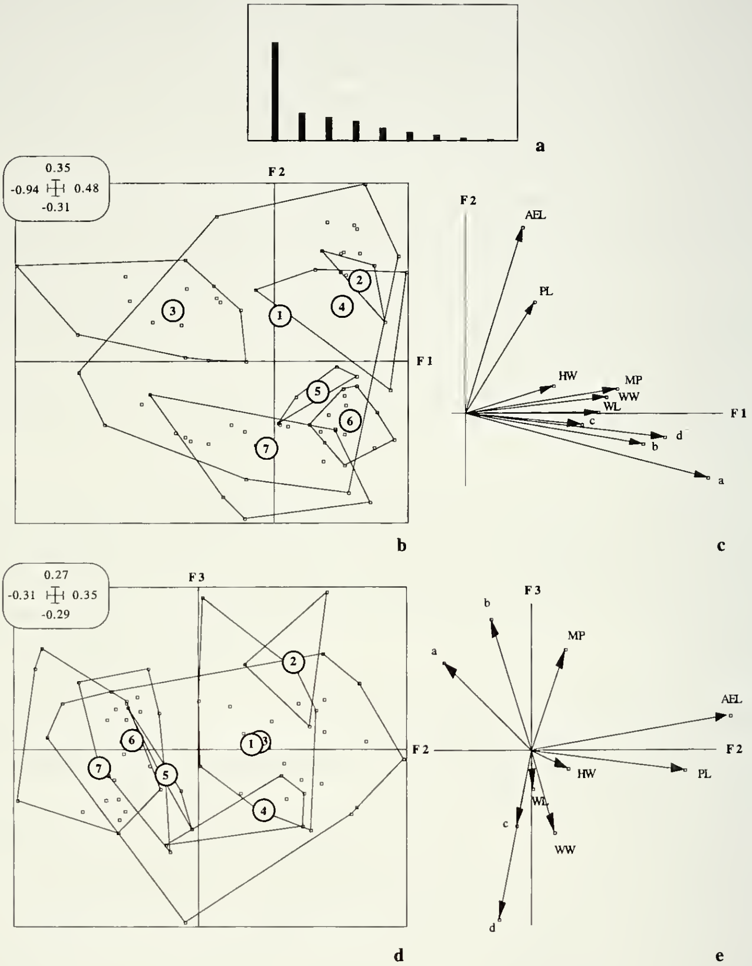

Fig. 7

Principal Component Analysis (PCA) for centred data of males. a: eigenvalues; b, d: plots of 7 species projected onto F1/F2 and F2/F3 axes; c, e: variables (for abbreviations see material and methods); b, c: first (F1) and second (F2) function axes; d, e: second (F2) and third (F3) function axes. Species codes: 1 = *C. ambigua* sp. n.; 2 = *C. antucana* sp. n.; 3 = *C. araucana* sp. n.; 4 = *C. boldti* sp. n.; 5 = *C. mendocina* (Kieffer & Jörgensen); 6 = *C. pehuenche* sp. n.; 7 = *C. testacea* Blanchard.

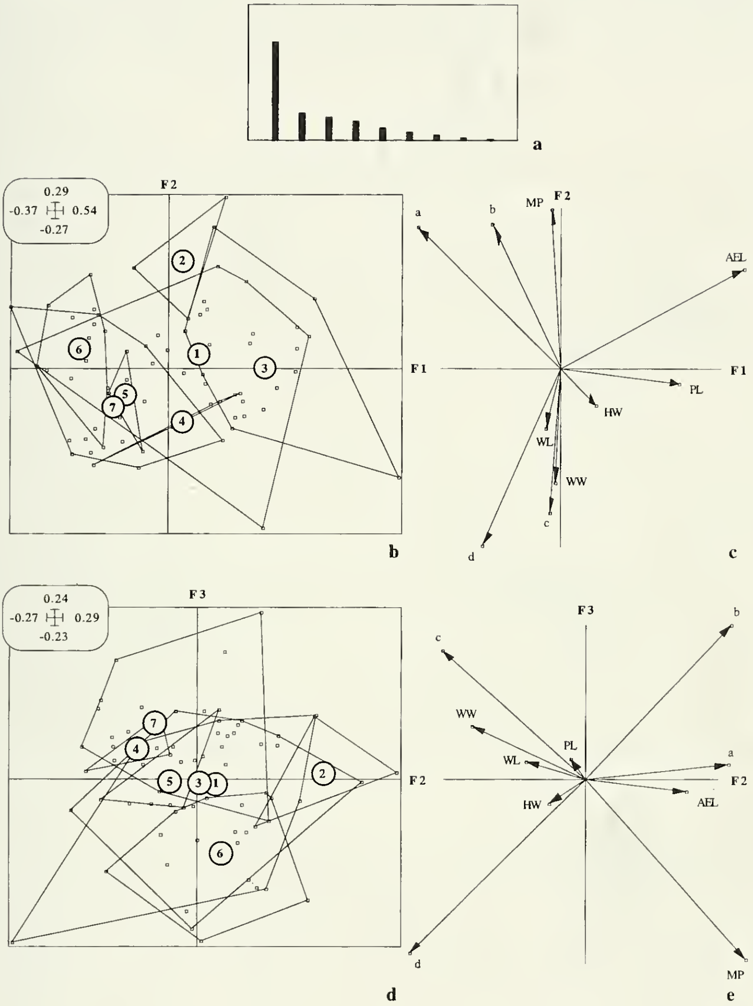

FIG. 8

Principal component analysis (PCA) for doubly centred data of males. a: eigenvalues; b, d: plots of 7 species projected onto F1/F2 and F2/F3 axes; c, e: variables (for abbreviations see material and methods); b, c: first (F1) and second (F2) function axes; d, e: second (F2) and third (F3) function axes. Species codes: 1 = *C. ambigua* sp. n.; 2 = *C. antucana* sp. n.; 3 = *C. araucana* sp. n.; 4 = *C. boldti* sp. n.; 5 = *C. mendocina* (Kieffer & Jörgensen); 6 = *C. pehuenche* sp. n.; 7 = *C. testacea* Blanchard.

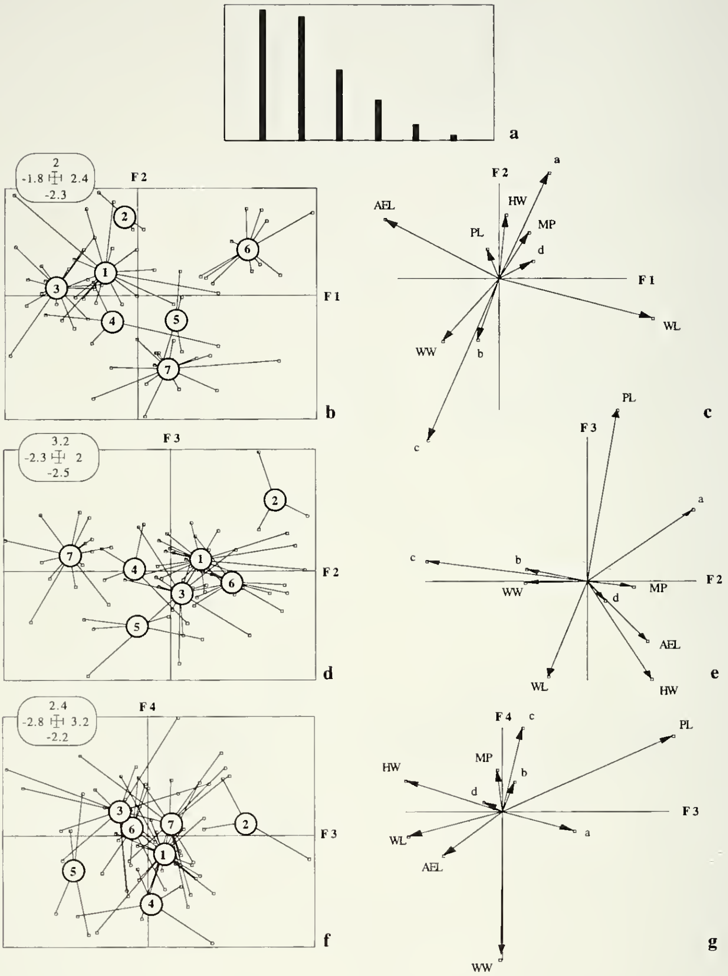

FIG. 9

Discriminant function analysis (DFA) of males. a: eigenvalues; b, d, f: plots of 7 species projected onto F1/F2, F2/F3 and F3/F4 axes; c, e, g: variables (for abbreviations see material and methods); b, c: first (F1) and second (F2) function axes; d, e: second (F2) and third (F3) function axes; f, g: third (F3) and fourth (F4) function axes. Species codes: 1 = *C. ambigua* sp. n.; 2 = *C. antucana* sp. n.; 3 = *C. araucana* sp. n.; 4 = *C. boldti* sp. n.; 5 = *C. mendocina* (Kieffer & Jörgensen); 6 = *C. pehuenche* sp. n.; 7 = *C. testacea* Blanchard.

variation) *C. antucana*, *C. mendocina* and *C. testacea* are separated by the variables *a*, *c*, *PL*, *WL* and *HW*. *C. boldti* is represented by insufficient material which makes its separation difficult (fig. 9d). On F4 (10 % variation) variable *WW* is most important and it separates *C. boldti* from the remainder of species.

ANALYSES OF FEMALES

From the 19 original variables, 12 were retained for the analyses: *HW*, *L3*, *AL*, *WL*, *WW*, *a*, *b*, *c*, *d*, *TL*, *FP* and *FSP*.

As for the males, the PCA for centred data (fig. 10) features on F1 (54 % variation) mostly size: the large-sized *C. testacea*, *C. araucana* and *C. boldti* are separated from the small-sized *C. pehuenche*, *C. mendocina* and *C. antucana*; again, *C. ambigua* has small and large individuals. F1 (fig. 10b) is characterised by all variables used in the analysis (fig. 10c). On F2 (17 % variation) *FSP*, *L3* and *a* separate *C. testacea*, *C. araucana* and *C. antucana* in one group and *C. pehuenche*, *C. mendocina* and *C. boldti* in another one.

In the PCA for doubly centred data (fig. 11), F1 (38 % variation) defines two groups, *C. pehuenche*, *C. mendocina* and *C. boldti*, and *C. testacea*, *C. araucana*, *C. ambigua* and *C. antucana*. F2 (21 % variation) separates *C. ambigua* from *C. testacea*, and *C. boldti* from *C. antucana* with the variables *AL*, *FS* and *FP*. F3 (12 % variation), finally, separates *C. pehuenche* and *C. mendocina*.

In the DFA (fig. 12) the groups from the PCA are even better defined on F1 (25 % variation) (fig. 12b) (*C. ambigua*, *C. antucana*, *C. araucana* and *C. testacea*, and *C. boldti*, *C. mendocina* and *C. pehuenche*) by *FP* and *WL*. F2 (23 % variation) separates *C. boldti* from *C. antucana* by the variables *WL* and *FS*. Finally, F3 (21 % variation) separates *C. ambigua* from the other species by the variables *HW* and *WL*.

CONCLUSIONS

The morphometric analyses confirm the groupings obtained by qualitative morphological characters and host-plant data, as well as the suitability of the chosen morphometric characters for separating the species.

As has been suggested in the literature (FOOTTIT 1992; YOCCOZ 1993; DOLÉDEC *et al.* 1995), our analyses confirm that in the PCA for centred data, F1 places the taxonomic units mostly according to size. The size differences found in *C. ambigua* may represent size differences found in different generations. The material was, however, insufficient to test this hypothesis.

The PCA for doubly centred data (not presuming *a priori* groupings) separates both males and females, though the separation in females (fig. 11b, d) is more clear-cut than that in the males (fig. 11b, d). The same trend is found in the DFA (with predefined groupings) (figs 9b, d, f, 12 b, d, f).

The variables with the highest discriminant power are as follows: - males, PCA for doubly centred data: F1/F2, *a* and *AEL*; F2/F3, *d* and *MP*; DFA: F1/F2, *AEL* and *WL*; F2/F3, *a* and *c*; - females, PCA for doubly centred data: F1/F2, *a* and *L3*; F2/F3, *c* and *FS*; DFA: F1/F2, FP and *WL*; F2/F3, *WL* and *TL*.

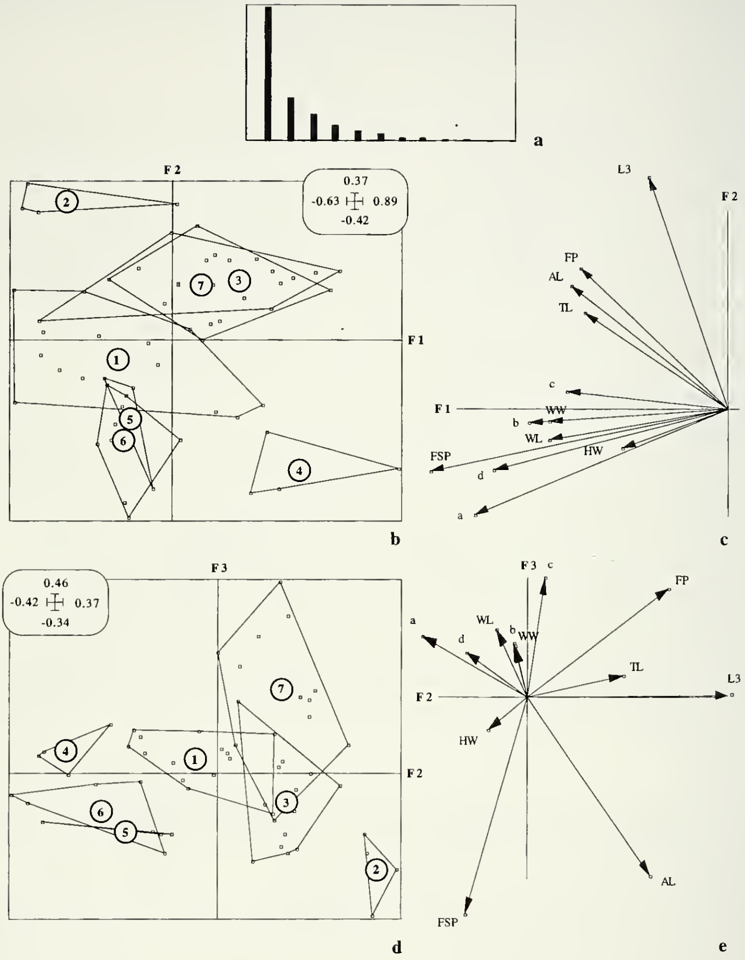

FIG. 10

Principal component analysis (PCA) for centred data of females. a: eigenvalues; b, d: plots of 7 species projected onto F1/F2 and F2/F3 axes; c, e: variables (for abbreviations see material and methods); b, c: first (F1) and second (F2) function axes; d, e: second (F2) and third (F3) function axes. Species codes: 1 = *C. ambigua* sp. n.; 2 = *C. antucana* sp. n.; 3 = *C. araucana* sp. n.; 4 = *C. boldti* sp. n.; 5 = *C. mendocina* (Kieffer & Jörgensen); 6 = *C. pehuenche* sp. n.; 7 = *C. testacea* Blanchard.

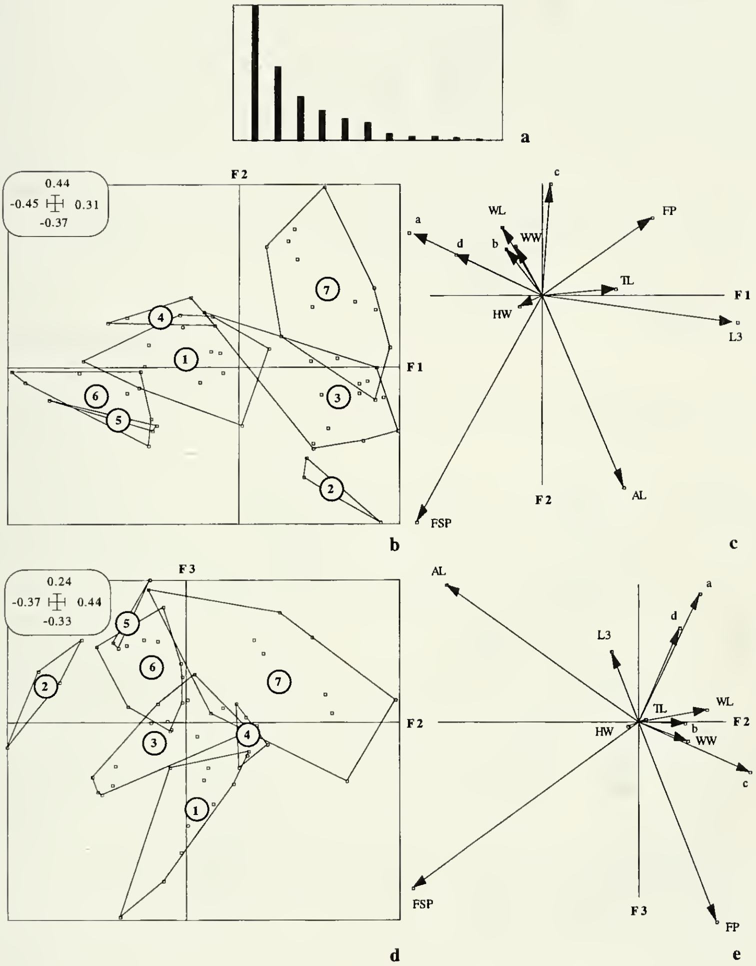

FIG. 11

Principal component analysis (PCA) for doubly centred data of females. a: eigenvalues; b, d: plots of 7 species projected onto F1/F2 and F2/F3 axes; c, e: variables (for abbreviations see material and methods); b, c: first (F1) and second (F2) function axes; d, e: second (F2) and third (F3) function axes. Species codes: 1 = *C. ambigua* sp. n.; 2 = *C. antucana* sp. n.; 3 = *C. araucana* sp. n.; 4 = *C. boldti* sp. n.; 5 = *C. mendocina* (Kieffer & Jörgensen); 6 = *C. pehuenche* sp. n.; 7 = *C. testacea* Blanchard.

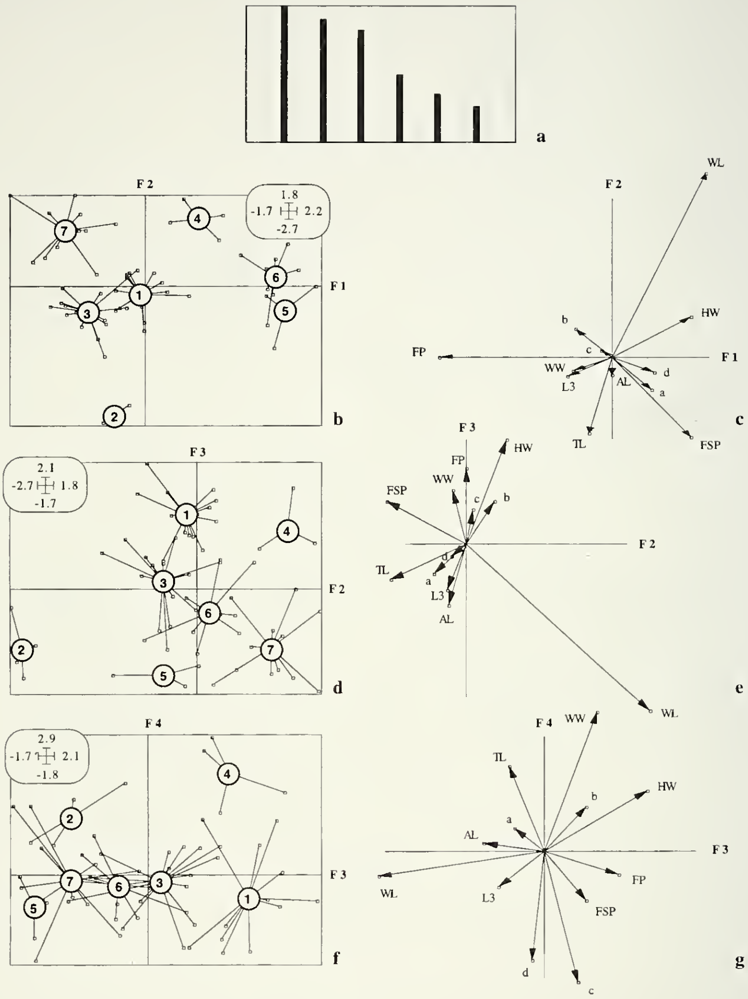

FIG. 12

Discriminant function analysis (DFA) of females. a: eigenvalues; b, d, f: plots of 7 species projected onto F1/F2, F2/F3 and F3/F4 axes; c, e, g: variables (for abbreviations see material and methods) b, c: first (F1) and second (F2) function axes; d, e: second (F2) and third (F3) function axes; f, g: third (F3) and fourth (F4) function axes. Species codes: 1 = *C. ambigua* sp. n.; 2 = *C. antucana* sp. n.; 3 = *C. araucana* sp. n.; 4 = *C. boldti* sp. n.; 5 = *C. mendocina* (Kieffer & Jörgensen); 6 = *C. pehuenche* sp. n.; 7 = *C. testacea* Blanchard.

There are two cases of species pairs which are difficult to separate with morphological characters alone: *C. pehuenche* / *C. mendocina* (figs 16i, 17a, 34e, 35a), and *C. testacea* / *C. araucana* (figs 16f, 17d, 33c, 37f), respectively. Both the PCA for doubly centred data and the DFA separate *C. pehuenche* and *C. mendocina* in the male analyses. In the female PCA for doubly centred data they are superimposed on F1/F2 and only partly separated on F2/F3, but completely separated in the DFA. The same situation we find in the females of *C. testacea* and *C. araucana*. In the male PCA for doubly centred data the species are separated on F1/F2 but are superimposed on F2/F3. They are well separated in DFA.

Unexpectedly, all analyses show clearly that the species are much better defined morphometrically in the females than in the males.

Calinda Blanchard, stat. rev.

Calinda Blanchard, 1852: 309. Type species: *Calinda testacea* Blanchard, subsequent designation by BURCKHARDT 1988: 146.

Description. Adult. Moderate to large-sized Triozidae. Head (figs 1e, 3, 4a, b, 5a, b) about as wide as pronotum, distinctly narrower than thorax; hardly or weakly deflexed from longitudinal body axis (fig. 5a, b). Vertex subrectangular, flattened with indented foveae. Genae not or little expanded to form small tubercular processes. Setosity on vertex short or long, long setae present on genae. Eyes large, adpressed to head. Antennae 10-segmented, with each a subapical rhinarium on segments 4, 6, 8 and 9; segment 10 with an unequal pair of blunt apical setae (figs 1c, 5c, d). Clypeus hemispherical, weakly protruding in profile. Distal labial segments short. Thorax, in profile, strongly arched above (fig. 5a, b). Pronotum transverse; foremargin downcurved, laterally curved backwords. Mesopraescutum and mesoscutum of subequal longitudinal length in the middle, much longer than pronotum; with short or long setae dorsally (fig. 4c, d). Male proctiger (fig. 1d) without, with short or long apical process; hindmargin almost straight, weakly or strongly produced or lobed, hairy. Male subgenital plate globular and usually covered in long setae. Paramere usually simple, lamellar, straight or curved, and often with one or several strongly sclerotised apical teeth, sometimes complex; often with variably distributed fine or thick setae on the inner face. Aedeagus very long and slender; apical dilatation relatively small, sometimes with small or large tooth ventro-basally close to or in distance from shaft. Female genitalia (fig. 2a) usually long including a long spiniform process on both proctiger and subgenital plate (figs 27, 34-40), sometimes with dorsal teeth on the process of the proctiger and often with peg setae apically (figs 28-30). Sometimes shorter and pointed or truncate apically (figs 25, 30). Ventral margin of subgenital plate usually with a bend or a hump in the middle. Valvulae often very long and styliform (fig. 2b). Valvula dorsalis short, triangular or very long. Valvula ventralis often with ventral apical saw, which may or not be defined at the base. Legs robust. Metacoxa with large horn-shaped meracanthus; metatibia with 1+3 strongly sclerotised apical spurs. Forewing long, usually transparent, widest in the middle or in the apical third (fig. 1a, b). Apex rounded or subacute. Vein R+M+Cu_1 strictly trifurcating, Rs long, straight or, more often, bent towards the foremargin in the middle, ending beyond bifurcation of vein M. Surface spinules often restricted to base of cell cu_2, but sometimes present in all cells. Radular spinules present in cells m_1, m_2 and cu_1, forming narrow stripes or broad triangles. Hindwing transparent, about three quaters forewing length.

Fifth instar larva (fig. 6). Yellowish, brown or black, surface rugous and leathery. Body elongate, weakly flattened. Antennae 6-segmented, curved backwards, segment 3 thick, segments 3 and 4 sometimes incompletely subdivided; rhinaria formula 466 or 3466. Head and thorax without or with inconspicuous setosity. Abdomen dorsally and ventrally with conspicuous segmentation, sometimes laterally and posteriorly with lanceolate setae. Abdominal apex broadly rounded or narrowed, sometimes indented or with a pair of teeth. Circumanal ring small, multicellular or absent. Legs robust, femora often thickened; tibio-tarsus indistinctly subdivided, with a strong inner tooth apically. Claws large, tarsal arolium membranous as long as or longer than claws. Wing pads elongate, relatively narrow, adpressed to body; margin sometimes with thick setae.

Comments. *Calinda* is well-defined within the Triozidae by a combination of morphological (adult and larval) and biological features. The former are detailed above, the latter consist of the development of the larvae in flowerheads of their asteraceous hosts and the gall induction. Several of these galls have been recorded in the literature (HOUARD 1933; tables 1, 2). In contrast, there is only one previous larval description which can be referred to *Calinda* without doubt. It is that by RÜBSAAMEN (1899) who mentioned galls on *Senecio falklandicus* (which is certainly a misidentification) from Southern Chile (Punta Arenas) and described larvae similar to those of *C. patagonica*. The characters listed by BURCKHARDT (1988) were taken from the larval description of material from Argentina (Mendoza) by Del GUERCIO (1914) which concerns *Trioza steinbachi* and not *Calinda*.

HOLLIS (1984), MARTIN & HOLLIS (1992) and BURCKHARDT & LAUTERER (1997) pointed out that the definitions of most of the some 70 described triozid genera are poor and that their phylogenetic relationships are unknown. In the absence of a formalised generic classification based on scientific methods, it is impossible to analyse the phylogenetic relationships of *Calinda*. BURCKHARDT (1988) suggested that the aedeagus shape may indicate a close relationship between species of *Calinda*, of the *Trioza berberidis* Burckhardt group and of some Triozidae from New Zealand. In addition, BURCKHARDT (1988) noted a general resemblance between members of Calinda and of the *Trioza hastata* group, which develop also on *Baccharis* s. l. (MHNG data). HODKINSON (1989) mentioned similar possible relationships. The larvae of New Zealand species (FERRIS & KLYVER 1932; TUTHILL 1952; MARTIN & MALUMPHY 1995) differ from those of *Calinda* in their flattened body form, in the ventrally positioned anus, in the small claws and tarsal arolia and in the presence of sectasetae. These differences are considered to be important suggesting that there are no close phylogenetic links between species from temperate South America and New Zealand. The larval morphology of *Calinda* is highly specialised and well adapted to life in flowerheads, in contrast to species of the *Trioza hastata* group which develop in leaf roll galls. Both groups have a posteriorly (in contrast to a ventrally) positioned anus, a multicellular circumanal ring (reduced in some *Calinda* spp.), back-curved 6-segmented antennae, an elongate body form, a sclerotised inner tooth on the tibiotarsal apex, large claws and tarsal arolia, and relatively narrow wing pads. These characters are also shared by members of *Kuwayama* and *Levidea* developing on the asteraceous genus *Flourensia*. These characters are interpreted here as synapomorphies of a group of predominantly temperate and subantarctic neotropical, gall-forming Triozidae including *Calinda*, *Kuwayama*, *Levidea*, and the *Trioza hastata* group. Recently collected larval material (MHNG data) suggests that the *Trioza berberidis* group, as defined by BURCKHARDT (1988), is artificial. *Trioza miltosoma* (Blanchard), *Trioza fissa* Burckhardt, *Trioza dendroseridis* Burckhardt and Trioza striacauda Burckhardt have dorso-ventrally strongly flattened larvae bearing lateral sectasetae and a ventral anus. The remainder forms a probably monophyletic group whose larvae have 9-segmented straight antennae and a large, unicellular circumanal ring. We conclude that there is no close relationship between these species and the *Calinda/Kuwayama* complex.

KEY TO MALES

1 Proctiger bearing tubular process which is more than 1.5 times as long as its basal width (figs 13, 14a). 2
- Proctiger without tubular process or with short process which is not longer than its basal width (figs 14b-i, 15-17, 18a-f). 11
2 Paramere massive with transverse sclerotized subapical ridge on the inner face. 3
- Paramere slender, lacking transverse subapical ridge on the inner face. 5
3 Paramere lamellar (fig. 21a). . . . . *C. broomfieldi*
- Paramere complex. 4
4 Paramere, in profile, irregularly triangular (fig. 21b). . . . . *C. magniforceps*
- Paramere, in profile, indistinctly T-shaped (fig. 21c). . . . . *C. peruana*
5 Paramere, in profile, bottle-shaped, strongly narrowed in apical half (fig. 21d). . . . . *C. osorii*
- Paramere not strongly narrowed in apical half. 6
6 Paramere, in profile, straight. 7
- Paramere, in profile, weakly curved or angular. 9
7 Inner face of paramere covered in thick spines (fig. 21e). . . . . . . *C. salicifoliae*
- Inner face of paramere with few thin setae. 8
8 Surface spinules absent from apical cells of forewing (fig. 41f). *C. baccharidis*
- Surface spinules present in apical cells of forewing (fig. 41g). . . . *C. velardei*

9 Paramere evenly curved (fig. 21h). . . . . *C. proximata*

\- Paramere angular (fig. 21i). 10

10 Small species, WL < 3.0. Genitalia as in fig. 13i. . . . . *C. tuthilli*

\- Large species, WL > 3.0. Genitalia as in fig. 14a. . . . . *C. jibara*

11 Proctiger with large quadrangular posterior lobes (fig. 14b-d). 12

\- Proctiger straight or weakly produced posteriorly, but not quadrangular, at most with narrow angular lobes. 14

12 Proctiger light, contrasting with dark brown subgenital plate and paramere; genitalia as in fig. 14b. . . . . *C. albonigra*

\- Proctiger, subgenital plate and paramere of the same colour; genital morphology different. 13

13 Paramere, in profile, almost straight, slender (fig. 21m). . . . . *C. penai*

\- Paramere, in profile, distinctly bent, wide (fig. 21n). . . . . *C. gibbosa*

14 Paramere, in profile, spatulate (fig. 21o). . . . . *C. spatulata*

\- Paramere different. 15

15 Paramere broad (fig. 22a-p). 16

\- Paramere narrow (figs 23a-q, 24a-q). 29

16 At least a few surface spinules present in apical cells of forewing. 17

\- Surface spinules absent from forewing, apart from cell cu_2. 18

17 Forewing transparent in anterior half, yellowish in posterior half. . *C. huggerti*

\- Forewing uniformly ochreous, yellowish or colourless. . . . . *C. peterseni*

18 Setae on mesonotum shorter than 0.05 mm, usually as long as or shorter than distance between them. 19

\- Setae on mesonotum longer than 0.08 mm, distinctly longer than distance between them. 24

19 Apical dilatation of distal segment of aedeagus without or with small ventro-basal hook (fig. 19i, k). 20

\- Apical dilatation of distal portion of aedeagus with large hook (fig. 19l). . . . 21

20 Paramere, in profile, weakly produced along foremargin subapically (fig. 22d). . . . . *C. aguilari*

\- Paramere, in profile, bearing distinct lobe along foremargin subapically (fig. 22e). . . . . *C. inca*

21 Paramere strongly constricted subapically (fig. 22f). . . . . *C. parviceps*

\- Paramere weakly contricted subapically. 22

22 WLHW > 5.5. . . . . *C. hodkinsoni*

\- WLHW < 5.5. 23

23 Forewing relatively short and wide, WLW < 2.4; paramere as in fig. 22h. . . . . *C. chionophili*

\- Forewing longer and narrower, WLW > 2.4. 24

24 Paramere as in fig. 22i. . . . . *C. patagonica*

\- Paramere as in fig. 22k. . . . . *C. reversyi*

25 Posterior margin of proctiger straight. 26

\- Posterior margin of proctiger produced; paramere different. 28

26 Proctiger massive (fig. 15g). . . . . *C. yungas*

- Proctiger slender (fig.15h, i). 27

27 Anterior margin of paramere, in profile, distinctly angular subapically (fig. 22m). . . . . *C. microcephala*

- Anterior margin of paramere, in profile, weakly rounded subapically (fig. 22n). . . . . *C. otavalo*

28 Paramere, in profile, rounded apically (fig. 22o). . . . . *C. brevicauda*

- Paramere, in profile, truncate apically (fig. 22p). . . . . *C. panamensis*

29 Paramere with large anteriorly directed hook apically. 30

- Paramere at most with small anteriorly directed point apically. 32

30 Setae of mesonotum shorter than distance between them; forewing bluntly angular or pointed apically. . . . . *C. trinervis*

- Setae on mesonotum longer than distance between them; forewing rounded apically. 31

31 Radular spinules forming broad triangles; paramere as in fig. 23b. . . . . *C. longicollis*

- Radular spinules forming narrow stripes; paramere as in fig. 23c. . . . . *C. falciforceps*

32 Paramere truncate apically (fig. 23d-q). 33

- Paramere narrowly rounded or pointed apically (fig. 24a-l). 40

33 Apical dilatation of aedeagus without hook (though sometimes with fold which may look like a hook in low magnification). 34

- Apical dilatation of aedeagus with small ventro-basal hook which is close to shaft (magnification 400 x). 36

34 Paramere relatively slender in distal half, antero-apical hook as in fig. 23d, e. . . . . *C. araucana*

- Paramere relatively broad in distal half. 35

35 Paramere with distinct postero-apical tooth (fig. 23f-i). . . . . *C. ambigua*

- Paramere angular postero-apically but without distinct tooth (fig. 23k, l). . . . . *C. boldti*

36 Posterior margin of paramere strongly produced in basal half; inner surface along hind-margin densely covered in thick setae (fig. 23m, n). 37

- Posterior margin of paramere weakly produced in basal half; thick setae along hind-margin sparse. 38

37 Body colour predominantly dark brown; forewing membrane light brownish. Paramere as in fig. 23m. Chile. . . . . *C. pehuenche*

- Body colour predominantly yellow; forewing membrane colourless. Paramere as in fig. 23n. Argentina. . . . . *C. mendocina*

38 Paramere distinctly narrowed in the middle (fig. 23o). Central America. . . . . *C. hollisi*

- Paramere ± parallel-side (fig. 23p, q). Southern South America. 39

39 Forewing widest in the middle. Proctiger massive (fig. 17c). . . . . . *C. antucana*

- Forewing wide in apical third; membrane colourless. Proctiger slender (fig. 17d). . . . . *C. testacea*

40 Paramere sickle-shaped (fig. 24a-g). 41
- Paramere different (fig. 24h-l). 47
41 Forewing transparent, colourless. 42
- Forewing uniformly yellow to ochreous or with bands alongs the veins. . . . 46
42 Paramere longer than proctiger, narrow (fig. 24a). . . . . *C. graciliforceps*
- Paramere shorter. 43
43 Forewing rounded apically as in fig. 44g. . . . . *C. longicaudata*
- Forewing angular. 44
44 Paramere slender with a narrow band of thick spines along hindmargin on the inner surface (fig. 24c). . . . . *C. plaumanni*
- Paramere broad with a wide band of thick spines along the hindmargin on the inner face. 45
45 Proctiger, in profile, widest in basal third and narrowing to apex (fig. 17h). . . . . *C. collaris*
- Proctiger ± of the same width along its length (fig. 17i). . . . . *C. branisai*
46 Forewing with yellow or ochreous bands alongs the veins. Apical dilatation of aedeagus short, rounded with ventro-basal hook (fig. 20q). . . . . *C. longistylus*
- Forewing uniformly yellow to ochreous. Apical dilatation of aedeagus elongate without ventro-basal hook (fig. 20r). . . . . *C. fumipennis*
47 Forewing rounded apically (fig. 45a). Genitalia as in fig. 18c. . . *C. gladiformis*
- Forewing angular apically (fig. 45b-d). Genitalia different. 48
48 WL > 3.0; setae on vein C+Sc longer than distance between them. Genitalia as in fig. 18d. . . . . *C. simoni*
- WL < 3.0; setae on vein C+Sc as long as or shorter than distance between them. 49
49 Paramere as in fig. 24k. Apical dilatation of aedeagus without hook (fig. 20u). . . . . *C. beingoleai*
- Paramere as in fig. 24l. Apical dilatation of aedeagus with distinct ventro-basal hook (fig. 20v). . . . . *C. muiscas*

KEY TO FEMALES

1 Apex of proctiger upturned or truncate (fig. 25a, c, e). 2
- Apex of proctiger, straight, pointed. 4
2 Surface spinules present in apical cells of forewing. . . . . *C. velardei*
- Surface spinules of forewing absent except for cell cu$_2$. 3
3 Apex of vein M$_{1+2}$ about equidistant between apices of veins Rs and M$_{3+4}$. Genitalia as in fig. 25c, d. . . . . *C. trinervis*
- Apex of vein M$_{1+2}$ much closer to apex of vein Rs than of M$_{3+4}$. Genitalia as in fig. 25e, f. . . . . *C. longicollis*
4 Genitalia globular with spiniform process on proctiger, and without or short spiniform process on subgenital plate at the base of which is a small lobe on either side (figs 26a, c, 27a). 5
- Genitalia different. 7

5 Subgenital plate without process (fig. 26a). . . . . *C. magniforceps*
- Subgenital plate with process. 6
6 Process on subgenital plate very small (fig. 26c). . . . . *C. peruana*
- Process on subgenital plate moderately long (fig. 27a). . . . . *C. broomfieldi*
7 Forewing rounded apically, Rs weakly sinuous, transparent in anterior half, yellowish in posterior half; surface spinules present in all cells along outer wing margin (fig. 42d). . . . . *C. huggerti*
- Forewing different. 8
8 Valvula dorsalis short (fig. 28b). Either forewing with surface spinules or mesothorax with setae which are as long as or longer than distance between them (in *C. chionophili* slightly shorter). 9
- Valvula dorsalis long (fig. 32d); surface spinules absent and mesonotum with short setae. 19
9 Forewing with surface spinules. 10
- Forewing without surface spinules except for base of cell cu$_2$. 11
10 Forewing (fig. 42e, f) with veins Rs almost straight, radular areas conspicuously brown. . . . . *C. peterseni*
- Forewing (fig. 42m.) with vein Rs distinctly sinuous, radular areas not much darker than surrounding membrane. . . . . *C. patagonica*
11 FPHW < 1.6, c/d ≤ 1.9. 12
- FPHW > 1.6, c/d > 1.9. 16
12 Valvula ventralis with well-defined ventral saw. . . . . *C. chionophili*
- Valvula ventralis without ventral saw. 13
13 Apex of vein M_{1+2} of forewing about equdistant from apices of veins Rs and M_{3+4} (fig. 43e). . . . . *C. brevicauda*
- Apex of vein M_{1+2} of forewing distinctly closer to apex of Rs than to M_{3+4} (fig. 43i). 14
14 Apical projection of proctiger weakly curved downwards, much longer than subgenital plate (fig. 30a). TLHW < 1.2, WLHW < 6.1. . . *C. falciforceps*
- Apical projection of proctiger straight, a bit longer than subgenital plate (fig. 30c, e). TLHW > 1.2, WLHW > 6.1. 15
15 Forewing membrane colourless; WLHW < 6.25. . . . . *C. panamensis*
- Forewing menbrane with yellowish or light brownish tinge; WLHW > 6.25. . . . . *C. spatulata*
16 WLHW > 6.50; TLHW > 1.4. 17
- WLHW < 6.50; TLHW < 1.4. 18
17 Subgenital plate distinctly shorter than proctiger (fig. 31a). . . . . *C. otavalo*
- Subgenital plate only a little shorter than proctiger (fig. 31c). *C. microcephala*
18 Apical half of cell r1 strongly narrowed (fig. 42i); WL > 3.5. . . . . *C. parviceps*
- Apical half of cell r1 weakly narrowed (fig. 42k); WL < 3.5. . . . *C. hodkinsoni*
19 Ventral margin of subgenital plate with large hump in the middle (fig. 32c). 20
- Ventral margin of subgenital plate without or with small hump in the middle (fig. 32e). 21

20 Process of proctiger long. . . . . *C. penai*

- Process of proctiger short (fig. 32c). . . . . *C. gibbosa*

21 Apical projection of proctiger with well-defined dorsal teeth or indistinct tubercles. 22

- Apical projection of proctiger without dorsal teeth or tubercles. 31

22 Apical projection of proctiger strongly inflated (fig. 32e). . . . . *C. antucana*

- Apical procection of proctiger not inflated. 23

23 Apical projection of proctiger very long (fig. 33a). . . . . *C. gladiformis*

- Apical projection of proctiger moderately long. 24

24 Ventral saw of valvula ventralis with large teeth, well-delimited at base (fig. 33d). . . . . *C. araucana*

- Ventral saw of valvula ventralis either with small teeth or gradually evanescent at base. 25

25 Proctiger ± evenly tapering to apex, dorsal margin straight or weakly concave; ventral margin of subgenital plate without distinct tubercle in the middle (fig. 33e). . . . . *C. baccharidis*

- Proctiger with distinct apical process, dorsal margin angularly concave; ventral margin of subgenital plate often with distinct tubercle in the middle (fig. 34a, c). 26

26 Apical process of subgenital plate relatively gradually separated from base; ventral margin without tubercle nor strongly produced in the middle (fig. 34a). . . . . *C. beingoleai*

- Apical process of subgenital plate well-defined at base; ventral margin with tubercle or strongly produced in the middle (fig. 34c). 27

27 AL > 1.2; ALHW > 2.0. Ecuador. . . . . *C. albonigra*

- AL < 1.2; ALHW < 2.0. Argentina, Chile. 28

28 Process of subgenital plate relatively long, ending beyond the middle of process of proctiger. Base of subgenital plate elongate. 29

- Process of subgenital plate relatively short, ending ± in the middle of process of proctiger. Base of subgenital plate subglobular. 30

29 Forewing membrane colourless. Body colour yellowish, greenish. Process of subgenital plate only slightly over half the length of basal portion (fig. 34e). Argentina. . . . . *C. mendocina*

- Forewing membrane infuscate. Body colour with dark brown patches. Process of subgenital plate about three quarters the length of basal portion (fig. 35a). Chile. . . . . *C. pehuenche*

30 Cell cu ratio of forewing > 1.7. On *Neomolina paniculata*. . . . . *C. boldti*

- Cell cu ratio of forewing < 1.7. On *Pingraea salicifolia*. . . . . . . *C. salicifoliae*

31 Forewing with yellow or ochreous bands along the veins. . . . . . *C. longistylus*

- Forewing colourless or uniformly yellow. 32

32 Process of subgenital plate less than half as long as process of proctiger. . . . 33

- Process of subgenital plate more than half as long as process of proctiger. . . 37

33 Forewing membrane distinctly yellowish or ochreous. Genitalia as in fig. 36c. Colombia. . . . . *C. osorii*

- Forewing membrane ± colourless. Genitalia different. Peru, Chile. 34

34 Apical process of subgenital plate relatively long, ending about in the middle of process of proctiger. 35
- Apical process of subgenital plate relatively short, ending distal to the middle of process of proctiger. 36
35 Subgenital plate with large ventral hump in the middle (fig. 36e). Peru. *C. inca*
- Subgenital plate with small ventral hump in the middle (fig. 37a). Chile. . . . . *C. ambigua*
36 Apical process of subgenital plate very short (fig. 37d). Peru. . . . . . *C. aguilari*
- Apical process of subgenital plate relatively longer (fig. 37f). Chile. . . . . *C. testacea*
37 Both proctiger and subgenital plate ± evenly tapering to apex (figs 38a, c). . . 38
- Proctiger and/or subgenital plate abruptly narrowed to form an apical process (figs 38e, 39a, c, f, 40a, c, e). 39
38 WL > 3.9. Peru. . . . . *C. simoni*
- WL < 3.4. Mexico, U.S.A. . . . . *C. longicaudata*
39 Forewing membrane brownish. Genitalia as in fig. 38e. . . . . *C. fumipennis*
- Forewing membrane transparent. Genitalia different. 40
40 Apical process of subgenital plate longer than base (fig. 39a). 41
- Apical process of subgenital plate shorter than base (figs 39f, 40a). 42
41 WLHW < 5.2. U. S. A. . . . . *C. proximata*
- WLHW > 6.4. Costa Rica. . . . . *C. hollisi*
42 Apical process of proctiger shorter than base. . . . . *C. collaris*
- Apical process of proctiger as long as or longer than base. 43
43 Apical process of subgenital plate relatively well-defined at base (fig. 40a). Mexico. . . . . *C. graciliforceps*
- Apical process of subgenital plate gradually passing into basal portion (fig. 40a, c). South America. 44
44 WLHW < 5.3; WLW < 2.7. Bolivia. . . . . *C. branisai*
- WLHW > 5.3; WLW > 2.7. Brazil. . . . . *C. plaumanni*

KEY TO FIFTH INSTAR LARVA

1 Abdomen broadely rounded apically, without marginal lanceolate setae. On *Senecio patagonicus*. . . . . *C. patagonica*
- Abdomen rounded or angular, always with marginal lanceolate setae. 2
2 Circumanal ring reduced. Lanceolate setae on abdominal margin short, thick. 3
- Circumanal ring developed. Lanceolate setae on abdominal margin long, fine. 6
3 Abdominal apex strongly narrowed with two distinct apical teeth. 4
- Abdominal margin narrowly rounded with, at most, two blunt tubercles. 5
4 Abdominal apex with dorsal lanceolate setae. On *Pingraea sphaerocephala*. . . . . *C. testacea*
- Abdominal apex without dorsal lanceolate setae. On *Baccharis* spp. . . . . *C. araucana*

5 On *Baccharis* spp. . . . . *C. ambigua*
\- On *Pingraea salicifolia*. . . . . *C. salicifoliae*
6 Abdomen with a pair of indistinct blunt tubercles apically. On *Neomolina pteronioides*. . . . . *C. longicaudata*
\- Abdomen broadely rounded apically. On *Baccharis* and *Pingraea* spp. . . . . *C. collaris* and *C. longistylus*

Calinda aguilari (Tuthill), comb. n. (Figs 14i, 19i, 22d, 37d, e, 42g)

Trioza aguilari Tuthill, 1959: 21. Holotype ♂, Peru: Ancash, Bandera Blanca, slope of Carpis, 30.xii.1958, *Baccharis* sp. (L. D. Tuthill) (USNM) (examined).
Trioza aguilaria; Hodkinson & White, 1981: 510, misspelling.

Material examined. Peru: Ancash: holotype ♂, 28 ♂ and ♀ paratypes, Bandera Blanca, slope of Carpis, 30.xii.1958, Baccharis sp. (L. D. Tuthill); 1 ♂, paratype, Monterrey Baños, 21.xi.1958 (L. D. Tuthill); - Huánuco: 1 ♀, paratype, near San Rafael, 2300 m, 31.xii.1958 (L. D. Tuthill); 1 ♀, near Ambo, 27.xii.1958 (L. D. Tuthill); - Lima: 2 ♂, 2 ♀ paratypes, 2♀ not type series, Rimac Valley, 2300 m, 19.xii.1958 (L. D. Tuthill); 1 ♀, Rimac Valley, km 115, 19.xii.1958 (L. D. Tuthill); 1 ♀, near Huaral, 7.x.1958 (L. D. Tuthill); dry and slide mounted (MHNG, USNM).

Distribution. Peru (Ancash, Huánuco, Lima). Previously known from Peru (TUTHILL 1959; HODKINSON & WHITE 1981).

Description. Adult. Head and body greenish, yellowish or ochreous. Thoracic dorsum with darker patches, dorsum of head and thorax in some females dark brown. Antennal segments 1-4 or 6 ochreous, 5 or 7-10 dark brown. Processes of female genitalia brown. Forewing transparent with light veins.

Forewing subacute apically; vein Rs in the middle shallowly and evenly curved toward foremargin; costal setae shorter than distance between them. Surface spinules present only in cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular, with very short apical process, posterior margin weakly produced. Paramere shorter than proctiger, wide, truncate apically with two sclerotised apical teeth, medial constriction weak; inner surface covered in setae laterally, basally and in apical half. Apical dilatation of distal segment of aedeagus elongate, with ventro-basal hook which is close to shaft. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process without dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Apex of circumanal ring not extended. Ventral margin of female subgenital plate with moderately developed hump medially, apical process short. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements. ♂ (2): HW 0.50; AL -; ALHW -; L3/L4 2.00; LLHW 0.66; TLHW 1.24; WL 2.80; WLHW 5.60; WLW 2.50; a/b 1.38; c/d 1.67; MP 0.33; MPHW 0.66; PL 0.27; AEL 0.25. ♀ (1): HW 0.53; AL -; ALHW -; L3/L4 1.77; LLHW 0.62; TLHW 1.11; WL 3.13; WLHW 5.90; WLW 2.50; a/b 1.53; c/d 1.72; FP 0.87; FPHW 1.62; FPC 5.44; FSP 1.81.

Larva unknown.

Host-plant. Adults were collected on *Baccharis* sp.

Comments. BURCKHARDT (1988) erroneously referred 2 ♂ from Argentina to *C. aguilari*. The specimen from NMHU belongs to *C. hodkinsoni*; the specimen deposited in HMNH is probably destroyed (T. Vásárhelyi, pers. comm.).

Calinda albonigra sp. n. (Figs 14b, 19c, 21l, 34c, d, 41l)

Holotype ♂, Ecuador: Napo, N Papallacta, 4100 m, 14.ii.1983 (L. Huggert), dry mounted (MZLU).

Paratypes. Ecuador: 5 ♂, 2 ♀, same data as holotype; 1 ♀, Napo, Papallacta, 3700 m, 25.ii.1983 (L. Huggert); dry and slide mounted (MHNG, MZLU).

Distribution. Ecuador (Napo).

Description. Adult. Head brownish yellow with foveae and coronal suture dark brown. Antennal segments 1-5 brownish yellow, 6-10 black. Pronotum and mesopraescutum ochreous with dark brown stripes, mesoscutum black with yellowish orange stripes, mesoscutellum ochreous, metascutellum and metapseudonotum black. Abdomen dark brown with whitish intersegmental membranes. Male subgenital plate and paramere black, proctiger whitish to yellowish. Female genitalia whitish or yellowish with brown base and apical processes. Legs ochreous, femora with brown patches. Forewing yellowish with brownish yellow veins. Hindwing transparent.

Forewing subacute apically; vein Rs weakly sinuous; costal setae longer than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, quadrate, with very short apical process. Paramere longer than proctiger, narrow, narrowly rounded apically with sclerotised, anteriorly pointed, apical tooth; medial constriction absent; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate with apical membranous projection. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process with dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with moderately developed hump in the middle. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (2): HW 0.53-0.56; AL 1.33; ALHW 2.38; L3/L4 1.44-1.78; LLHW 0.55-0.78; TLHW 1.13-1.24; WL 3.25-3.62; WLHW 6.13-6.58; WLW 1.19-1.37; a/b 1.38-1.53; c/d 1.76-1.89; MP 0.25-0.28; MPHW 0.47-0.50; PL 0.30-0.36; AEL 0.16-0.25. ♀ (1): HW 0.55; AL -; ALHW -; L3/L4 1.78; LLHW 0.78; TLHW 1.24; WL 3.62; WLHW 6.58; WLW 2.64; a/b 1.53; c/d 1.89; FP 1.11; FPHW 2.02; FPC 3.96; FSP 1.34.

Larva and host-plant unknown.

Calinda ambigua sp. n. (Figs 16g, 20d, 23f-i, 37a-c, 43l)

Holotype ♂, Chile: Prov. Colchagua, La Rufina, Río Tinguiriríca, 650 m, 11.i.1996, *Baccharis linearis* (D. Burckhardt) #41(1), dry mounted (MHNG).

Paratypes. Argentina: Río Negro: 1 ♀, El Bolsón, 8.ii.1961 (Topál), Nr. 261; - Salta: 2 ♂, 1 ♀, 2500 m, iii-iv.1905 (S. V. Steinbach); slide mounted (MNHG).

Chile: IV Reg.: 1 ♀, Choapa, km 272 Panamericana Norte, 17.xii.1985, *Baccharis* x *concava* (M. Elgueta), 96-005; 2 ♂, same data but 20.viii.1985; 1 ♀, Parque Nacional Fray Jorge, foot of hill, 18.ii.1985, *Baccharis linearis* ssp. *linearis* (D. Hollis); - V Reg.: 5 ♂, Parque Nacional La Campana, 1100 m, 11.i.1985, *Tristerix* sp. (D. Hollis); - Reg. Metropolitana: 1 ♂, 1 ♀, Maipo Valley, Motocoton, 10.i.1985, *Baccharis linearis* ssp. *linearis* (D. Hollis); 1 ♀, Parque Nacional Peñuelas, 1.vii.1966 (L. Marnefn), 96-005; - VI Reg.: 89 ♂, 65 ♀, same data as holotype: 1 ♂, Prov. Cachapoal, Termas de Cauquenes, 800 m, 10.i.1996, *Baccharis linearis* (D. Burckhardt), #40(3): - VII Reg.: 1 ♂, 1 ♀, Maule, Pellines, S Constitución, 16.xii.1976 (A. G. Gurney); 2 ♂, 2 ♀, 10 km NW Cauquenes, 14.i.1985, *Baccharis neaei* (D. Hollis); 3 ♂, 2 ♀, 24 km Cauquenes to Chanco Road, 14.i.1985, *Baccharis neaei* (D. Hollis); 2 ♂, 2 ♀, same data but Cauquenes, Pelluhue; 4 ♂, 9 ♀, Prov. Cauquenes, E Cauquenes, 400 m, 12.ii.1996, *Baccharis linearis* (D. Burckhardt), #83(2); 1♂, 1♀, same but Reserva Nacional Los Ruiles, 35°49'S 72°32'W, 200-350 m, 6.i.1994, *Baccharis* sp. (D. Burckhardt), #48(5); 1 ♂, Prov. Talca, km 15 junction Vilches, 600 m, 16.i.1996, *Baccharis* sp. (D. Burckhardt), #47(1); 1 ♂, Prov. Talca, Alto Vilches, 6.x.1983 (L. E. Peña); 1 exuvia, Prov. Talca, Parque Gil de Vilches, sector Majadillas, 1350-1550 m, 13.i.1996 (D. Burckhardt), #44; 2 ♀, Prov. Talca, Parque Gil de Vilches, sector Piedras Blancas, 1350-1600 m, 12.i.1996, *Baccharis* sp. (D. Burckhardt), #43(7): - VIII Reg.: 4 ♂, 4 ♀, Prov. Bio-Bio, 10 km W Antuco, 500 m, 23.i.1996, *Baccharis linearis* (D. Burckhardt), #59(1); 4 ♂, 7 ♀, 1 exuvia, Prov. Bio-Bio, Laguna del Laja, sector Meseta del Toro, 1500 m, 20.i.1996, *Baccharis* sp. (D. Burckhardt), #55(7); 15 ♂, 3 ♀, Prov. Ñuble, km 10 on road from Cabrero to Yungay near province border, 200 m, 18.i.1996, *Baccharis linearis* (D. Burckhardt), #51(1); 2 ♂, 1 ♀, 16 km NNW Los Angeles, 17.i.1985, *Baccharis* sp. (D. Hollis): 2 ♂, 1 ♀, Prov. Ñuble, 10 km W Termas de Chillán, 1250 m, 12-13.xii.1990, *Baccharis neaei*, *Nothofagus* forest (Agosti & Burckhardt), #5b; 10 ♂, 3 ♀, Puente San Juan 1, Villa los Boldos, km 33 Concepción to Florida/Villa San Ramón Road, 9.vi.1996, *Baccharis* sp. (Garrido); 1 ♀, Culenco, Santa Juana to Nacimiento, 1.v.1996, *Baccharis* sp. (Garrido); 1 ♂, 1 ♀, San José, Santa Juana to Nacimiento, 84 km S Concepción, 12.v.1996, *Baccharis* sp. (Garrido); 1 ♂, Prov. Bio-Bio, 4 km SE Los Angeles, Sector Huaqui, 5.viii.1995, *Baccharis* sp. (T. Olivares); 1 ♂, 1 ♀, 1 larva, Prov. Bio-Bio, Laguna del Laja, sector Meseta del Toro, 1500 m, 20.i.1996, Baccharis sp. (D. Burckhardt), #55(7); 8 ♂, 2 ♀, same data but #56(6); 1 ♂, 1 ♀, same data but Parque Nacional Laguna del Laja to Abanico, 900-1100 m, 22.i.1996, *Baccharis linearis*, #58(7); - IX Reg: 1 ♂, 1 ♀, Prov. Cautín, Parque Nacional Conguillio, sector Laguna Verde, 1000 m, 30.i.1996, *Baccharis* sp. (D. Burckhardt), #69(1); 2 ♂, 1 ♀, Prov. Malleco, 3 km N Traiguén - Victoria Road, 7.viii.1995, *Baccharis* sp. (T. Olivares); 1 ♂, 3 ♀, Prov. Malleco, Alto San José, 4 km N Traiguén, 5.viii.1995, *Baccharis* sp. (T. Olivares); - X Reg.: 1 ♀, Chiloé Island, 42 km N Castro, 9.ii.1985, *Baccharis* spp. (D. Hollis); - XII Reg.: 1 ♀, 2 exuviae, Prov. Ultima Esperanza; Monumento Natural, Cueva del Milodón, 150 m, 11.i.1991, *Baccharis mylodontis* (D. Burckhardt), #34; 1♂, 1♀, Magallanes, Punta Arenas, Parque John Fell, 14-23.iv.1982, yellow pan tray 11 (J. Petersen C.); 1 ♀, same data but 18.iii-2.iv.1982; 1 ♀, same data but 20.v-4.vi.1982; dry and slide mounted, and stored in alcohol (BMNH, MHNG, MNNC, NHMB, NMHU).

Distribution. Argentina (Río Negro, Salta), Chile (IV-X, XII Reg. and Reg. Metropolitana).

Description. Adult. Male. Head yellowish brown. Antennal segments 1-4 yellowish brown to dark brown, 5-10 black. Pronotum yellow to ochreous, mesopraescutum, mesoscutum ochreous to reddish brown, mesoscutellum brown. Abdomen brownish green to black. Genitalia yellow. Legs brownish yellow, tarsi black. Forewing transparent with brownish yellow veins and radular spinules. Hindwing transparent. Female. Head green to ochreous. Antennal segments 1-4 ochreous, 5-10 black. Pronotum ochreous, mesopraescutum ochreous with four yellowish brown longitudinal stripes, two laterally and two in the middle, mesoscutellum ochreous. Abdomen with genitalia yellow, apical process of proctiger black. Legs yellowish brown, tibiae, tarsi light brown. Forewing yellowish with yellowish brown veins and radular spinules. Hindwing transparent.

Forewing subacute apically, vein Rs in the middle shallowly and evenly curved toward foremargin; costal setae as long as distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, tubular, with short apical process, hindmargin weakly produced. Paramere longer than proctiger, narrow, truncate apically with two sclerotised teeth, medial constriction weak, entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate without processes. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process without dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of subgenital plate with medially moderately developed hump; apical process long. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (17): HW 0.49-0.66; AL 0.81-1.07; ALHW 1.65-1.94; L3/L4 1.30-2.00; LLHW 0.53-0.76; TLHW 0.66-1.54; WL 2.40-3.28; WLHW 4.44-5.68; WLW 1.92-3.01; a/b 1.27-2.28; c/d 1.32-1.89; MP 0.26-0.40; MPHW 0.48-0.73; PL 0.29-0.45; AEL 0.28-0.45. ♀ (14): HW 0.54-0.69; AL 0.72-1.15; ALHW 1.30-1.74; L3/L4 1.36-2.10; LLHW 0.49-0.90; TLHW 0.88-1.80; WL 2.83-3.72; WLHW 4.26-6.32; WLW 2.38-2.88; a/b 1.06-1.58; c/d 0.68-1.79; FP 0.78-1.29; FPHW 1.39-2.29; FPC 3.43-5.90; FSP 1.33-1.76.

Fifth instar larva. Light brown. Body elongate, abdomen relatively narrow and angular apically. Abdominal margin and apex with relatively short lanceolate setae. Abdominal apex with two blunt indistinct teeth. Circumanal ring absent.

Host-plants. *Baccharis mylodontis* Hellwig and B. sp., adults were also collected on *B.* x *concava* (Ruiz & Pavón) Pers., *B. linearis* (Ruiz & Pavón) Pers. and *B. neaei* DC.

Comments. The records of *T. testacea*, *T. testacea* form a and *T.* nr *testacea* from Argentina and Chile (BURCKHARDT 1988) concern partially *C. ambigua*.

Calinda antucana sp. n. (Figs 17c, 20i, 23p, 32e-g, 44d)

Holotype ♂, Chile: X Reg., Province Chiloé, Parque Nacional Chiloé, Rancho Grande, Río Cypresal, 0-150 m, 8.ii.1996, *Baccharis* sp. (D. Burckhardt), #80(3), dry mounted (MHNG).

Paratypes. Chile: X Reg.: 5 ♂, 5 ♀, same data as holotype; 1 ♀, Chiloé Island, 42 km N Castro, 9.ii.1985, *Nothofagus dombeyi* (D. Hollis); 1 ♂, 2 ♀, Antuco near Puyehue, 4.ii.1985, *Baccharis patagonica* ssp. *palenae* (D. Hollis); dry and slide mounted (BMNH, MHNG, NHMB).

Distribution. Chile (X Reg.).

Description. Adult. Head and pronotum yellowish to brown, mesopraescutum, mesoscutum and mesoscutellum with dark brown stripes; mesopseudonotum yellowish. Antennal segments 1-2 yellowish with dark brown apices, 3 light yellow, 4-10 dark brown. Abdomen brown, including genitalia, brown with yellow intersegmental membranes. Legs yellowish with dark brown spots. Forewing yellowish with light brown veins.

Forewing subacute apically; vein Rs abruptly bent towards foremargin in the middle; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, tubular, with very short apical process, hindmargin moderately produced. Paramere as long as proctiger, narrow, truncate apically with two strongly sclerotised teeth, medial constriction absent; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate with small ventro-basal hook which is close to shaft. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process inflated with conspicuous dorsal teeth; peg setae dense, present only laterally, regulary spaced. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump medially, apical process long. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements ♂: (2) HW 0.60-0.62; AL 1.35-1.45; ALHW 2.25-2.33; L3/L4 1.60-1.72; LLHW 0.63-0.69; TLHW 1.15-1.17; WL 2.91-3.13; WLHW 4.85-5.05; WLW 2.65-2.77; a/b 1.41-1.53; c/d 1.36- 1.70; MP 0.39; MPHW 0.65-0.70; PL 0.41-0.42; AEL 0.39-0.40. ♀ (4): HW 0.59-0.63; AL 1.21-1.44; ALHW 2.01-2.29; L3/L4 1.63-1.82; LLHW 0.63-0.71; TLHW 1.15-1.24; WL 2.81-3.35; WLHW 4.68-5.47; WLW 2.45-2.54; a/b 1.37-1.46; c/d 1.36-1.65; FP 1.05-1.18; FPHW 1.75-1.90; FPC 3.81-5.04; FSP 1.25-1.38.

Larva unknown.

Host-plant. Adults were collected on *Baccharis patagonica* Hook. & Arn. ssp. *palenae* (Phil.) Hellwig.

Calinda araucana sp. n. (Figs 2a, b, 16f, 20c, 23d, e, 33c, d, 43k)

Holotype ♂, Chile: X Reg., Prov. Valdivia, Monumento Natural Alerce Costero, near El Mirador, 25-30 km W La Unión, 950 m, 29.xii.1990, *Baccharis zoellneri* spp. *zoellneri* (Agosti & Burckhardt), #24a, dry mounted (MHNG).

Paratypes. Argentina: Jujuy: 1 ♂, Yturbe, 31.xii.1984 (L. E. Peña); - Río Negro: 1 ♀, El Bolsón, 27.x.1961 (Topál), Nr. 662; 1 ♂, 1 ♀, same data but 8.ii.1961, Nr.261; dry and slide mounted (MHNG).

Chile: VII Reg.: 1 ♂, Prov. Talca, Parque Gil de Vilches, sector Laguna El Alto, 2000-2500 m, 15.i.1996, *Baccharis* sp. (D. Burckhardt), #46(1); - IX Reg.: 6 ♂, 6 ©, Prov. Malleco, Parque Nacional Nahuelbuta, 1300 m, 16-17.xii.1990, *Baccharis zoellneri* spp. *minor*, *Nothofagus antarctica* forest (Agosti & Burckhardt), #11; 10 ♂, 6 ©, same data but Administración to Piedra del Aguila, 1200 m, 24-25.xi.1992, *Baccharis lycioides* (D. Burckhardt), #32(4); 2 ♂, 1 ♀, Prov. Malleco, Parque Nacional Nahuelbuta, Coimallin, 20.i.1985 (D. Hollis); 3 ♂, 2 ♀, same data but Pehuenco, 18-20.i.1985, *Baccharis* sp.; 1 ♀, Prov. Malleco, Nahuelbuta, 2.ii.1994 (J. E. Barriga), 40357; 2 ♂, 2 ♀, Loncoche, near El Liuco, 28-29.i.1985, *Baccharis obovata* ssp. *obovata* (D. Hollis); - X Reg.: 21 ♂, 8 ♀, same data as holotype; 2 ♂, same data but 850 m, #24b; 1 ♂, Prov. Valdivia, km 17-21 Valdivia to Curiñanco Road, 200-400 m, 28-30.xii.1990, *Baccharis elaeoides* (Agosti & Burckhardt), #23; 1 ♀, Prov. Osorno, Parque Nacional Puyehue, sector Mirador Los Mallines, 700 m, 1-3.ii.1996 (D. Burckhardt), #72b; 1 ♂, 1 exuvia, Prov. Llanquihue, Junction Maullín on Puerto Montt to Pargua Road, 50 m, 4.ii.1996, Baccharis sp. (D. Burckhardt), #76b(4); dry and slide mounted (BMNH, MHNG, MNNC).

Distribution. Argentina (Jujuy, Río Negro), Chile (VII, IX and X Reg.).

Description. Adult. Head and mesopraescutum yellow to black, mesoscutum with black stripes. Antennal segments 1-3 yellow to dark brown, 4-10 dark brown to black. Abdomen black with yellow intersegmental membranes. Genitalia yellow, paramere yellow with black patches, proctiger light yellow. Legs yellow to yellowish brown with black patches. Forewing light yellow with light brown veins and radular spinules. Hindwing transparent.

Forewing subacute apically; vein Rs abruptly bent towards foremargin in the middle; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, tubular, with very short apical process, hindmargin produced. Paramere longer than proctiger, narrow, truncate apically, anteriorly with large, pointed tooth, posteriorly angled, medial constriction absent; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate without processes. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process with dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with moderately developed hump. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with short, basally well-defined saw.

Measurements: ♂ (15) HW 0.48-0.56; AL 0.88-1.07; ALHW 1.66-1.94; L3/L4 1.44-2.15; LLHW 0.60-0.79; TLHW 0.98-1.95; WL 2.27-2.96; WLHW 4.37-5.48; WLW 1.60-2.96; a/b 1.07-2.44; c/d 1.37-1.92; MP 0.27-0.37; MPHW 0.48-0.59; PL 0.30-0.37; AEL 0.31-0.37. ♀ (14): HW 0.49-0.67; AL 0.94-1.08; ALHW 1.71-1.98; L3/L4 1.11-2.33; LLHW 0.59-0.78; TLHW 0.59-1.11; WL 2.51-3.61; WLHW 4.78-5.39; WLW 1.87-2.74; a/b 1.23-1.62; c/d 1.23-1.89; FP 0.92-1.20; FPHW 1.72-2.14; FPC 4.12-7.67; FSP 1.08-1.91.

Fifth instar larva. Ochreous, thorax dorsally darker, depressions on abdomen brown. Body elongate, abdomen relatively narrow and angular apically. Abdominal margin with relatively short lanceolate setae, apex without dorsal lanceolate setae. Abdominal apex with two distinct teeth. Circumanal ring absent.

Host-plant. *Baccharis* sp., adults were also collected on *Baccharis elaeoides* Remy, *B. lycioides* Remy, *B. obovata* Hook. & Arn. ssp. *obovata* Hook. & Arn., *B. zoellneri* Hellwig spp. *zoellneri* and ssp. *minor* Hellwig.

Calinda baccharidis (Tuthill), comb. n. (Figs 13f, 18m, 21f, 33e, f, 41f)

Trioza baccharidis Tuthill, 1959: 18. Holotype ♂, Peru: Lima, near Huaral, Valle de Chancay, 8.x.1958, *Baccharis lanceolata* (L. D. Tuthill) (USNM) (examined). Tuthill, 1964: 29.

Material examined. Peru: Ancash: 1♂, 1 ♀ paratypes, Monterrey Baños, 21-23.xi.1958 (L. D. Tuthill); - Lima: holotype ♂, 11 paratypes, near Huaral, Valle de Chancay, 8.x.1958, *Baccharis lanceolata* (L. D. Tuthill); 4 ♂, 5 ♀, Chancay 40 mi. N Lima, 29.vii.1971, shrubs near river, fertile irrigated region in arid coastal desert (P. S. & H. L. Broomfield) B.M. 1971-486; dry and slide mounted (BMNH, MHNG, USNM).

Distribution. Peru (Ancash, Cuzco, Lima) (TUTHILL 1959, 1964; HODKINSON & WHITE 1981; present data).

Description. Adult. Head, thorax and abdomen ochreous. Antennal segments 1-5 ochreous, 6-10 dark ochreous. Legs ochreous. Forewing transparent with ochreous veins.

Forewing bluntly angular apically; vein Rs abruptly bent towards foremargin in the middle; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular with apical process half as long as proctiger wide, hindmargin straight. Paramere shorter than proctiger, narrow, with strongly sclerotised forward directed tooth apically, medially slightly more slender; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate without ventro-basal tooth. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process with dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate without hump in the middle, apical process long. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with short, basally well-defined saw.

Measurements: ♂ (3): HW 0.57-0.62; AL 0.87-1.21; ALHW 1.53-1.95; L3/L4 1.73-2.00; LLHW 0.53-0.63; TLHW 0.86-1.03; WL 3.06-3.35; WLHW 5.37-5.61; WLW 2.59-2.96; a/b 1.32-1.48; c/d 1.46-1.77; MP 0.44-0.48; MPHW 0.77; PL 0.37-0.39; AEL 0.23. ♀ (3): HW 0.60-0.67; AL -; ALHW -; L3/L4 1.73; LLHW 0.67-0.69; TLHW 0.87-1.02; WL 3.40-3.54; WLHW 5.22- 5.67; WLW 2.71-2.84; a/b 1.35-1.46; c/d 1.37-1.65; FP 0.91-1.05; FPHW 1.52-1.57; FPC 5.02-5.25; FSP 1.10-1.26.

Larva unknown.

Host-plant. Adults were collected on *Baccharis lanceolata* Kunth.

Calinda beingoleai (Tuthill), comb. n. (Figs 1b, 18e, 20u, 24k, 34a, b, 45c)

Trioza beingoleai Tuthill, 1959: 20. Holotype ♂, Peru: Ancash, Baños de Monterrey, 21.xi.1958, *Baccharis floribunda* (L. D. Tuthill) (USNM) (examined).

Material examined. Peru: holotype ♂, 42 paratypes, Ancash, Baños de Monterrey, 21.xi.1958, *Baccharis floribunda* (L. D. Tuthill); dry and slide mounted (MHNG, USNM).

Distribution. Peru (Ancash) (TUTHILL 1959; HODKINSON & WHITE 1981).

Description. Adult. Head and mesoscutum ochreous with reddish brown stripes. Pronotum, mesopraescutum and mesoscutellum ochreous. Antennal segments 1-4 ochreous, 5-10 dark brown. Abdomen and genitalia ochreous with brownish paramere. Legs ochreous. Forewing transparent with ochreous veins.

Forewing subacute apically; vein Rs abruptly bent towards foremargin in the middle; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, wide triangles. Mesonotum with short setae. Male proctiger, in profile, slender, tubular, with very short apical process, hindmargin almost straight. Paramere longer than proctiger, narrow with strongly sclerotised, anteriorly directed tooth apically, slightly bent in the middle; inner surface covered in setae laterally and in apical half. Apical dilatation of distal segment of aedeagus elongate, lentil-shaped. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process with dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump medially. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (1): HW 0.48; AL -; ALHW -; L3/L4 2.00; LLHW 2.69; TLHW 1.27; WL 2.58; WLHW 5.38; WLW 2.84; a/b 0.98; c/d 1.55; MP 0.25; MPHW 0.52; PL 0.38; AEL 0.26. ♀ (1): HW 0.49; AL -; ALHW -; L3/L4 2.07; LLHW 0.94; TLHW 1.24; WL 2.82; WLHW 5.76; WLW 2.59; a/b 1.53; c/d 1.79; FP 1.09; FPHW 2.22; FPC 6.41; FSP 1.33.

Larva unknown.

Host-plant. Adults were collected on *Baccharis floribunda* H. B. K.

Calinda boldti sp. n. (Figs 16h, 20e, 23k, 35c-e, 43m)

Holotype ♂, Chile: IV Reg., 31 km W Ovalle, 19.ii.1985, *Baccharis* sp. (D. Hollis), dry mounted (BMNH).

Paratypes. Chile: IV Reg.: 5 ♀, Prov. Limarí, Parque Nacional Fray Jorge, 250 m, 7-9.xii.1990, *Baccharis*, mediterranean scrub (Agosti & Burckhardt), #2; 3 ♀, same data but *Neomolina paniculata*; 2 ♀, same data but *Baccharis linearis*; 7 ♀, same data but Alto de Talinay, 550 m, 6-7.xii.1990, #1b; 1 ♂, 2 ♀, same data but foot of hill, 18.ii.1985, *Baccharis linearis* ssp. *linearis* (D. Hollis); 1 ♀, Prov. Elqui, 15 km SW Viñita Baja, 29°50'S 70°50'W, 450 m, 4.xii.1993 *Baccharis* sp. (D. Burckhardt), #6; - Reg. Metropolitana: 1 ♀, Curacavi, W Santiago, 30.xi.1967 (J. Apablaza); - VII Reg.: 1 ♂, 1 ♀, Cauquenes, Pelluhue,14.i.1985, *Baccharis* sp. (D. Hollis); - X Reg.: 3 ♂, 1 ♀, Chiloé Island, 42 km N Castro, 9.ii.1985, *Baccharis* spp. (D. Hollis); - without locality data: 1 ♀ (C. S. A.), 1868; dry and slide mounted (BMNH, MHNG, MNNC).

Distribution. Chile (IV, VII, X Reg. and Reg. Metropolitana).

Description. Adult. Head and thorax ochreous, mesopraescutum and mesoscutum with reddish brown stripes. Antennal segments 1-8, ochreous 9-10 dark brown. Abdomen ochreous with dark brown spots. Female proctiger dark brown, subgenital plate ochreous. Legs ochreous. Forewing yellowish with ochreous veins and dark brown radular spinules.

Forewing subacute apically; vein Rs abruptly bent towards forewing in the middle; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, tubular, with very short apical process, hindmargin weakly produced. Paramere longer than proctiger, narrow, truncate apically with two apical teeth, medial constriction absent; entire inner surface covered in thick setae. Apical dilatation of distal segment of aedeagus elongate without ventro-basal tooth. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process with dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring extended distally. Ventral margin of female subgenital plate with flattened hump in the middle. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ® (4): HW 0.56-0.65; AL 1.08; ALHW 1.93; L3/L4 1.64-1.91; LLHW 0.56-1.27; TLHW 0.92-1.04; WL 2.93-3.35; WLHW 5.15-5.30; WLW 2.38-2.59; a/b 1.31-1.51; c/d 1.45-2.52; MP 0.30-0.35; MPHW 0.49-0.56; PL 0.37-0.41; AEL 0.24-0.40. © (2): HW 0.55-0.56; AL 0.72; ALHW 1.31; L3/L4 1.53-1.67; LLHW 0.55-0.79; TLHW 0.86-0.93; WL 2.52-2.85; WLHW 4.80-5.09; WLW 2.54-2.68; a/b 1.38-1.53; c/d 1.74-1.83; FP 0.73-0.78; FPHW 1.33-1.39; FPC 3.32-4.88; FSP 1.37-1.62.

Larva unknown.

Host-plant: Adults were collected on *Baccharis linearis* (Ruiz & Pavón) Pers. ssp. linearis (Ruiz & Pavón) Pers., *Neomolina paniculata* (DC.) Hellwig and *Baccharis* sp.

Calinda branisai sp. n. (Figs 17i, 20p, 24e, 40c, d, 44k)

Holotype ♂, Bolivia: Cochabamba, Ayopaya, Morochata, 3094 m, 19.vi.1980, ex papa - sweed (O. Bacon & D. Foster), dry mounted (USNM).

Paratypes. Bolivia: 1 ♂, 1 ♀, same data as holotype, slide mounted (MHNG, USNM).

Distribution. Bolivia (Cochabamba).

Description. Adult. Head, pronotum and mesopraescutum brownish yellow with brown patches, mesoscutellum brownish yellow. Antennal segments 1-4 brownish yellow, 5-10 dark brown. Abdomen and genitalia brownish yellow. Legs brownish yellow. Forewing transparent with brown veins.

Forewing subacute apically; vein Rs weakly sinuous; costal setae as long as distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, wide triangles. Mesonotum with short setae. Male proctiger, in profile, slender, tubular, with very short apical process. Paramere as long as proctiger, narrow, subacute apically, with anteriorly pointed sclerotised tooth, medial constriction absent; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate without processes. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process without dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with moderately developed hump in the middle. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (1): HW 0.53; AL -; ALHW -; L3/L4 0.75; LLHW -; TLHW 1.03; WL 2.52; WLHW 4.75; WLW 2.90; a/b 1.81; c/d 1.79; MP 0.31; MPHW 0.58; PL 0.28; AEL 0.24. ♀ (1): HW 0.53; AL -; ALHW -; L3/L4 -; LLHW 0.66; TLHW 1.11; WL 2.81; WLHW 5.30; WLW 2.68; a/b 1.33; c/d 1.56; FP 0.68; FPHW 1.28; FPC 3.24; FSP 1.42.

Larva and host-plant unknown.

Calinda brevicauda sp. n. (Figs 16a, 19s, 22o, 29d, e, 43e)

Holotype ♂, Ecuador: Napo, above Papallacta, 4100 m, 13.iii.1983 (L. Huggert), dry mounted (MZLU).

Paratypes. Ecuador: 1 ♂, 3 ♀, same data as holotype; 1 ♂, Napo, Papallacta, 24.ii.1983 (L. Huggert); 1♂, 1♀, Napo, Quito - Baeza Road, 4100 m, iii.1983 (L. Huggert); dry and slide mounted (MHNG, MZLU).

Distribution. Ecuador (Napo).

Description. Adult. Head ochreous with vertex and coronal suture dark brown. Antennal segments 1-2 dark brown, 6-10 black. Pronotum half black and half ochreous, mesopraescutum and mesoscutum ochreous with dark brown patches, mesoscutellum ochreous, metascutellum and metapseudonotum dark brown. Legs brownish yellow with brown patches, tarsi black. Abdomen dark brown with ochreous intersegmental membrane. Forewing transparent with ochreous veins. Hindwings transparent. Genitalia black.

Forewing rounded apically; vein Rs in the middle shallowly and evenly curved toward foremargin; costal setae longer than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, wide triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular, with short apical process, strongly produced posteriorly. Paramere shorter than proctiger, broad, truncate apically, with an anterior and a posterior apical tooth, medial constriction weak; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate with ventro-basal hook which is distant from shaft. Female proctiger shorter than four times circumanal ring length, acute apically; apical process with dorsal teeth; peg setae dense, present dorsally and laterally, regularly spaced. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump in the middle. Valvula dorsalis short, triangular. Valvula ventralis long, straight without apical saw.

Measurements: ♂ (2) HW 0.58-0.71; AL 1.66-1.75; ALHW 2.56-2.98; L3/L4 1.50-1.86; LLHW 0.71-0.93; TLHW 1.17-1.36; WL 3.18-4.16; WLHW 5.11-6.12; WLW 2.44-2.57; a/b 1.27-1.37; c/d 1.42-1.62; MP 0.43-0.56; MPHW 0.74-0.79; PL

0.32-0.42; AEL 0.40-0.44. ♀ (1): HW 0.68; AL 1.73; ALHW 2.98; L3/L4 1.86; LLHW 0.69; TLHW 1.21; WL 4.16; WLHW 6.12; WLW 2.46; a/b 1.37; c/d 1.57; FP 0.88; FPHW 1.29; FPC 3.38; FSP 1.19.

Larva and host-plant unknown.

Calinda broomfieldi sp. n. (Figs 13a, 18g, 21a, 27a, b, 41a)

Holotype ♂, Peru: Lima, Chancay, 40 mi. N Lima, 29.vii.1971, shrubs near river, fertile irrigated region in arid coastal desert (P. S & H. L. Broomfield), B.M 1971-486, dry mounted (BMNH).

Paratypes. Peru: 6 ♂, 9 ♀, same data as holotype; 1 ♀, Lima, near Huaral, 8.x.1958 (L. D. Tuthill); dry and slide mounted (BMNH, MHNG, USNM).

Distribution. Peru (Lima).

Description. Adult. Head, pronotum and mesopraescutum ochreous with dark patches. Antennal segments 1-5 ochreous, 6-10 brownish. Abdomen brownish with yellow intersegmental membranes. Genitalia ochreous. Legs ochreous with black tarsi. Forewing yellowish with yellow brownish veins. Hindwing transparent.

Forewing subacute apically; vein Rs weakly sinuous; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, thick, strongly produced posteriorly, with apical process half as long as proctiger wide. Paramere as long as proctiger, wide, weakly rounded or truncate apically with subapical, transverse carina; medial constriction weak; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate, apex subacute. Female proctiger shorter than four times circumanal ring length, straight, pointed apically; apical process with dorsal teeth; peg setae dense, present only laterally, regularly spaced. Circumanal ring not extended distally. Ventral margin of female subgenital plate with rounded hump medially. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (2): HW 0.48-0.55; AL 0.70; ALHW 1.46; L3/L4 -; LLHW 0.64-1.54; TLHW 0.96-1.08; WL 2.70-2.77; WLHW 5.04-5.63; WLW 2.70-2.83; a/b 1.39-1.59; c/d 1.71-1.85; MP 0.25-0.35; MPHW 0.52-0.64; PL 0.27-0.31; AEL 0.27-0.29. ♀ (2): HW 0.56-0.58; AL -; ALHW -; L3/L4 2.00; LLHW 0.59; TLHW 0.91-0.96; WL 2.99-3.17; WLHW 5.34-5.47; WLW 2.82-2.94; a/b 1.33-1.51; c/d 0.78-1.33; FP 0.69-0.76; FPHW 1.19-1.36; FPC 4.31-4.47; FSP 1.41-1.73.

Larva and host-plant unknown.

Calinda chionophili sp. n. (Figs 15d, 19n, 22h, 29a-c, 42l)

Holotype ♂, Chile: X Reg., Parque Nacional Puyehue, near Puyehue, Antillanca, crater rim, 3.ii.1985, *Senecio chionophilus* (D. Hollis), dry mounted (BMNH).

Paratypes. Chile: 28 ♂, 18 ♀, same data as holotype, dry and slide mounted (BMNH, MHNG).

Distribution. Chile (X Reg.).

Description. Adult. Head and antenna brownish green. Pronotum green, mesopraescutum and mesoscutum yellowish green with dark brown patches; mesoscutellum and metascutellum green. Abdomen with genitalia yellowish green. Legs green with dark brown patches. Forewing transparent with dark brown veins.

Forewing rounded apically; vein Rs weakly sinuous; costal setae as long as distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular, without apical process, hindmargin moderately produced. Paramere shorter than proctiger, wide, truncate apically, with two apical teeth, medial constriction weak, entire inner surface covered in long setae. Apical dilatation of distal segment of aedeagus elongate with ventro-basal hook which is distant from shaft. Female proctiger shorter than four times circumanal ring length, pointed apically; apical process with dorsal teeth; peg setae dense, present dorsally and laterally, regularly spaced. Circumanal ring extended distally. Ventral margin of female subgenital plate with flattened hump medially. Valvula dorsalis short, triangular. Valvula ventralis bearing short, basally well-defined saw.

Measurements: ♂ (2): HW 0.54-0.59; AL 1.27; ALHW 2.35; L3/L4 1.36-1.58; LLHW 0.78-0.86; TLHW 1.19-1.30; WL 2.37-2.51; WLHW 4.25-4.39; WLW 4.25-4.39; a/b 1.14-1.31; c/d 1.38-1.71; MP 0.35-0.38; MPHW 0.59-0.70; PL 0.32; AEL 0.35-0.37. ♀ (2): HW 0.58-0.59; AL 1.45; ALHW 2.50; L3/L4 1.29-1.36; LLHW 0.76; TLHW 1.19-1.24; WL 2.82-2.84; WLHW 4.81-4.86; WLW 2.31; a/b 1.29-1.40; c/d 1.25-1.32; FP 0.83-0.84; FPHW 1.42-1.43; FPC 3.23-3.95; FSP 1.22-1.29.

Larva unknown.

Host-plant. Adults were collected on *Senecio chionophilus*. Phil.

Calinda collaris (Crawford), comb. n. (Figs 17h, 20o, 24d, 39f, g, 44i)

Trioza collaris Crawford, 1910a: 229. Lectotype ♀, U. S. A.: California, Claremont (C. F. Baker) (USNM) (examined), here designated. Crawford, 1910b: 347.

Material examined. Mexico: 1 ♀, Coahuila, Saltillo, 23.ix.1941 (De Long, Good, Caldwell & Plummer), dry mounted (USNM).

U. S. A.: Arizona: 3 ♂, 2 ♀, Baboqvri Mts, 16.x.1937 (Oman); 1 ♂, Santa Cruz River near Tubac, 23.x.1937 (Oman); 1 ♂, same data but Sabino Canyon, 27.x.1937; - California: Lectotype ♀, Claremont (C. F. Baker); 4 ♂, 7 ♀, Los Angeles County (Coquillet); 2 ♂, same data but Palm Canyon, 4.vi.1935 (Oman) dry mounted; 1 ♀, Riverside, 19.ix.1968 (H. D. Pierce), 576 69-23145; 1 ♂, White Water, 29.ii.1968, *Baccharis* sp. (H. D. Pierce), 165 69-23145; - Texas: 1 ♀, El Paso, 19.viii.1908 (F. C. Pratt); 5 ♂, 4 ♀, 3 larvae, Jeff Davis County, Fort Davis, Limpia Creek, 19.ix.1986, *Baccharis salicifolia* (P. E. Bolt); 3 ♂, 3 ♀, 1 larva, same data but Musquiz Creek, Highway 118, 14 mi. SE Fort Davis, 15.x.1986 (T. O. Robbins); 1 ♀, Little Aguja Canyon, Jeff Davis County, Highway 1832, 16 mi. N Fort Davis, 6.ix.1984, *Baccharis glutinosa* (T. O. Robbins); dry and slide mounted (USNM, MHNG) 7928 dry mounted.

Distribution. Mexico (Coahuila), U.S.A. (Arizona, California, Texas) (CRAWFORD 1910a, b, 1911, 1914; BOLDT & ROBBINS 1990; present data).

Description. Adult. Head and thorax ochreous. Antennal segments 1-8 brownish ochreous, 9-10 brown. Pronotum and mesopraescutum ochreous. Legs and abdomen ochreous. Genitalia ochreous with black proctiger apex. Forewing transparent with brownish veins. Hindwing transparent.

Forewing subacute apically; vein Rs in the middle shallowly and evenly curved toward foremargin; costal setae shorter than distance between them. Surface spinules absent except for base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular, with short apical process, hindmargin weakly produced. Paramere shorter than proctiger, narrow, subacute with strongly sclerotised apical tooth; medial constriction absent; inner surface covered in thick setae forming a broad ribbon along the hindmargin. Apical dilatation of distal segment of aedeagus elongate. Female proctiger shorter than four times circumanal ring length, straight, pointed apically; apical process without dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with medially flattened hump. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (7): HW 0.56-0.65; AL 1.07-1.17; ALHW 1.80-2.00; L3/L4 1.69-1.17; LLHW 0.53-0.82; TLHW 0.57-1.05; WL 3.08-3.74; WLHW 5.25-5.95; WLW 2.23-2.84; a/b 1.42-2.27; c/d 1.57-2.43; MP 0.29-0.36; MPHW 0.50-0.64; PL 0.29-0.33; AEL 0.23-0.29. ♀ (4): HW 0.59-0.71; AL -; ALHW -; L3/L4 2.00-2.42; LLHW 0.61-0.76; TLHW 0.90-1.08; WL 3.34-3.73; WLHW 5.00-5.74; WLW 2.43-2.66; a/b 1.36-1.59; c/d 1.70-2.06; FP 0.76-0.84; FPHW 1.18-1.34; FPC 4.15-4.67; FSP 0.98-1.20.

Fifth instar larva. Yellowish with abdominal apex light brownish. Body elongate, abdomen relatively broad and evenly rounded apically. Abdominal margin with long lanceolate setae, apex with very few dorsal lanceolate setae. Abdominal apex without teeth. Circumanal ring developed, small, angular.

Host-plant. Specimens were reared from flower galls on *Pingraea salicifolia* (Ruiz & Pavón) Hellwig (= *Baccharis salicifolia*, = *B. glutinosa*).

Comments. The material recorded by CRAWFORD (1914) as *T. collaris* from California: Santa Cruz, 15.viii.1885 (Koebele); Santa Clara; and Argus Mountains concerns *C. longistylus*. *T. collaris* of BOLDT & ROBBINS (1990) from *Pingraea salicifolia* is true *C. collaris*, but the material collected on *Baccharis salicina* (BOLD & ROBBINS 1994) corresponds to *C. longistylus*.

Calinda falciforceps sp. n. (Figs 16e, 20b, 23c, 30a, b, 43i)

Holotype ♂, Ecuador: Napo, Papallacta, 24.ii.1983 (L. Huggert), dry mounted (MZLU).

Paratypes. Ecuador: 8 ♂, 7 ♀, sama data as holotype; 3 ♂, 4 ♀, Napo, Quito - Baeza Road, 4100 m, iii.1983 (L. Huggert); dry and slide mounted (MHNG, MZLU).

Distribution. Ecuador (Napo).

Description. Adult. Head yellowish brown to ochreous with black stripes on the vertex. Antennal segments dark brown to black. Pronotum ochreous, mesopraescutum yellowish brown to ochreous with dark brown stripes, mesoscutum, mesoscutellum and metascutellum black. Legs brownish yellow to ochreous, femora ochreous with brown patches. Abdomen black with ochreous patches. Genitalia black. Forewing yellowish with brownish yellow veins. Hindwing transparent.

Forewing rounded apically; vein Rs in the middle shallowly and evenly curved toward foremargin; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, wide triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular, with short apical process, strongly produced posteriorly. Paramere shorter than proctiger, narrow, rounded apically, with large sclerotised, anteriorly directed apical hook, medial constriction absent; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate with ventro-basal hook which is distant from shaft. Female proctiger shorter than four times circumanal ring length, pointed apically; apical process with dorsal teeth; peg setae dense, present dorsally and laterally, regulary spaced. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump medially. Valvula dorsalis short, triangular. Valvula ventralis long, straight without apical saw.

Measurements: ♂ (3): HW 0.62-0.68; AL 1.71-1.86; ALHW 2.51-2.86; L3/L4 1.96-2.35; LLHW 0.63-0.69; TLHW 1.19-1.29; WL 3.17-3.80; WLHW 5.10-5.85; WLW 2.38-2.53; a/b 1.10-1.44; c/d 1.28-2.00; MP 0.40-0.44; MPHW 0.65-0.66; PL 0.34-0.38; AEL 0.29-0.34. ♀ (3): HW 0.64-0.70; AL1.52-1.83; ALHW 2.27-2.63; L3/L4 1.65-2.05; LLHW 0.57-0.83; TLHW 0.74-0.84; WL 3.78-4.18; WLHW 5.66-5.97; WLW 2.22-2.47; a/b 1.42-1.51; c/d 1.50-1.80; FP 0.98-1.01; FPHW 1.44-1.55; FPC 3.16-4.39; FSP 1.32-1.43.

Larva and host-plant unknown.

Calinda fumipennis sp. n. (Figs 18b, 20r, 24g, 38e, f, 44m)

Holotype ♂, U. S. A.: California, San Nicolas Island, beach area from Sand Spit to Cany below Sewage Ponds, 22.vi.1978, *Baccharis* sp. (A. S. Menke, D. R. Miller & R. W. Rust), dry mounted (USNM).

Paratypes. U.S.A: California: 2 ♂, 2 ♀, same data as holotype; 2 ♂, 5 ♀, San Nicolas Island, Celery Canyon, 100 ft, 22-26.vi.1978 (A. S. Menke, D. R. Miller & R. W. Rust); 1 ♀, Santa Rosa Island, Windmill Canyon, North Fork, 50 ft, 7.vi.1978, *Baccharis* sp. (A. S. Menke, D. R. Miller & R. W. Rust); 11 ♂, 7 ♀, Alameda County, 23.vii.1919 (W. M. Giffard); 1 ♂, Kedwood Canyon, Alameda, vii.1916 (W. M. Giffard); 1 ♂, Miles Canyon, Alameda, 21.vi.1919 (W. M. Giffard); 1 ♀, same data but 15.iv.1917 (W. M. Giffard); 1 ♀, Carmel, 8.viii.1940 (D. J. & J. N. Knull); 1 ♂, 1 ♀, Honda, 24.vi.1935 (Oman); 2 ♂, San Mateo County, Honda Range, 7.v.1919; 3 ♂, 5 ♀, same data but San Mateo County, 17.v.1919; 1 ♂, Paso Robles, 29.v.1919 (W. M. Giffard); 1 ♂, 5 ♀, San Benito County, 9.viii.1940 (D. J. & J. N. Knull); 1 ♂, 1 ♀, Lampas, 8.vi.1938; 2 ♂, 5 ♀, without locality data; dry and slide mounted (USNM, MHNG).

Distribution. U. S. A. (California).

Description. Adult. Head and thorax ochreous. Antennal segments 1-8 brownish ochreous, 9-10 dark brown. Abdomen, genitalia and legs ochreous. Forewing pale yellow with ochreous veins. Hindwing transparent.

Forewing bluntly angular apically; vein Rs abruptly bent towards foremargin in the middle; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular, with short apical process, hindmargin moderately produced. Paramere as long as proctiger, narrow, ± evenly curved, subacute apically with strongly sclerotised tooth, medial constriction absent; inner surface covered in thick setae along hindmargin. Apical dilatation of distal segment of aedeagus elongate. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process without dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump medially. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (1): HW 0.59; AL 1.15; ALHW 1.95; L3/L4 2.15; LLHW 0.54; TLHW 0.97; WL 2.91; WLHW 4.93; WLW 2.91; a/b 1.66; c/d 2.12; MP 0.38; MPHW 0.64; PL 0.33; AEL 0.28. ♀ (1): HW 0.65; AL -; ALHW -; L3/L4 2.08; LLHW 0.65; TLHW 0.92; WL 3.21; WLHW 4.94; WLW 2.63; a/b 1.61; c/d 1.78; FP 0.82; FPHW 1.28; FPC 3.85; FSP 0.93.

Larva unknown.

Host-plant. Adults were collected on *Baccharis* sp.

Calinda gibbosa (Tuthill), comb. n. (Figs 14d, 19e, 21n, 32c, d, 42a, b)

Trioza gibbosa Tuthill, 1959: 20. Holotype ®, Peru: Ancash, Monterrey Baños, 21-23.xi.1958, *Baccharis floribunda* (L. D. Tuthill) (USNM) (examined).

Material examined. Colombia: 1 ♂, Narino, La Cruz, 19.x.1943 (F. R. Fosberg); 2 ♀, Pasto (B. Guevara); 4 ♀, Santa Elena, 28.xii.1930 (S. & C. H. Ballón); dry and slide mounted (MHNG, USNM).

Cuba: 3 ♂, 2 ♀, Oriente, Boquerón, ii.1979, *Baccharis* sp. (G. Morales), dry and slide mounted (BMNH, MHNG).

Ecuador: Napo: 1 ♀, N Papallacta, 4100 m, 14.ii.1983 (L. Huggert); 1 ♀, Papallacta, 3700 m, 25.ii.1983 (L. Huggert); - Pichincha: 1 ♀, Calderón, x.1930 (R. Benoist); 1 ♂, Quito, x.1930 (R. Benoist); 2 ♀, Quito, ix.1962 (J. C. M. C); dry and slide mounted (MHNG, MNHN, MZLU, USNM).

Peru: Ancash: holotype ♂, 10 paratypes, Baños Monterrey, 21-23.xi.1958, *Baccharis floribunda* (L. D. Tuthill); 1 ♂, 1 ♀ paratype, Bandera Blanca, 30.xii.1958 (L. D. Tuthill); - Lima: 1 paratype ♀, Rimac Valley, km 115, 19.xii.1958 (L. D. Tuthill); dry and slide mounted (USNM).

Distribution. Colombia, Cuba, Ecuador (Napo, Pichincha), Peru (Ancash, Lima) and possibly Venezuela (see comments) (TUTHILL 1959; HODKINSON & WHITE 1981; BURCKHARDT 1988; and present data).

Description. Adult. Male. Head and thorax ochreous, mesopraescutum and mesoscutum with dark brown stripes. Antennal segments 1-5 ochreous, 6-10 dark brown.

Abdomen ochreous with dark brown intersegmental membranes. Genitalia light brown. Legs ochreous. Forewing yellowish with brown veins. Female. Head ochreous to brownish green, pronotum ochreous, mesopraescutum green mixed with light brown patches centrally, mesoscutellum and abdomen green. Genitalia green with brown apical process. Forewing transparent with brown veins.

Forewing subacute apically; vein Rs weakly sinuous; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, quadrate, with very short apical process. Paramere longer than proctiger, narrow, bent in basal third, subacute and strongly sclerotised apically, medial constriction absent; inner surface covered in setae centrally and in apical half. Apical dilatation of distal segment of aedeagus elongate, incised in the middle, with membranous projection. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process with dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with large hump medially. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (4): HW 0.58-0.67; AL 1.33; ALHW 2.11; L3/L4 1.50-1.78; LLHW 0.60-1.24; TLHW 1.11-1.24; WL 3.48-4.00; WLHW 5.71-6.05; WLW 2.41-2.58; a/b 1.44-1.77; c/d 1.85-2.03; MP 0.27-0.30; MPHW 0.40-0.48; PL 0.30-0.42; AEL 0.24-0.41. ♀ (2): HW 0.64-0.66; AL -; ALHW -; L3/L4 1.60-1.78; LLHW 0.69-0.71; TLHW 1.12-1.28; WL 4.00-4.10; WLHW 6.06-6.41; WLW 2.44-2.55; a/b 1.43-1.50; c/d 1.70-2.09; FP 1.06-1.08; FPHW 1.06-1.08; FPC 4.32-5.05; FSP 1.20-1.38.

Larva unknown.

Host-plant. Adults were collected on *Baccharis floribunda* H. B. K. and *Baccharis* sp.

Comments. BURCKHARDT (1988) reported the species from Peru, Ecuador, Venezuela and Chile. The record from Chile concerns *C. penai*. The material from Venezuela was not reexamined, but it is quite likely that the species occurs there.

Calinda gladiformis sp. n. (Figs 18c, 20s, 24h, 33a, b, 45a)

Holotype ♂, Ecuador: Napo, Quito - Baeza Road, 4100 m, iii.1983 (L. Huggert), dry mounted (MZLU).

Paratypes. Ecuador: 21 ♂, 11 ♀, same data as holotype; 2 ♀, Napo, above Papallacta, 4100 m, 13.iii.1983 (L. Huggert); dry and slide mounted (MHNG, MZLU). Peru: 1 ♂, Junín, Satipo, 19.i.1984 (L. Huggert), slide mounted (MZLU).

Material not included in type series. Ecuador: 1 adult without abdomen, Napo, Quito - Baeza Road, 4100 m, iii.1983 (L. Huggert), dry mounted (MZLU).

Distribution. Ecuador (Napo), Peru (Junín).

Description. Adult. Head yellowish brown. Antennal segments 1-4 brownish yellow, 5-10 black. Pronotum dark brown with yellow spots, mesopraescutum black with four yellow stripes, mesoscutellum yellow, metascutellum and metapseudonotum black. Abdomen black with white intersegmental membranes. Genitalia black. Legs yellowish brown with brown patches, tarsi black. Forewing yellowish with brownish yellow veins. Hindwing transparent.

Forewing rounded apically; vein Rs weakly bent toward foremargin in the middle; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, wide triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular, with very short apical process. strongly produced posteriorly. Paramere longer than proctiger, narrow, bent in the middle, subacute apically with strongly sclerotised tooth, medial constriction absent, entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate anteriorly produced into long, pointed, membranous projection. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process with dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump medially. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (7): HW 0.51-0.57; AL 0.84-1.04; ALHW 1.65-1.96; L3/L4 1.81-2.27; LLHW 0.40-0.84; TLHW 1.04-1.25; WL 2.45-2.80; WLHW 4.30-5.49; WLW 2.61-2.87; a/b 1.22-1.42; c/d 1.29-1.53; MP 0.21-0.27; MPHW 0.38-0.53; PL 0.37-0.43; AEL 0.26-0.31. ♀ (5): HW 0.54-0.66; AL 1.00-1.12; ALHW 1.68-1.96; L3/L4 1.38-2.00; LLHW 0.68-1.14; TLHW 1.06-1.26; WL 2.94-3.24; WLHW 4.84-5.44; WLW 2.63-2.91; a/b 1.25-1.46; c/d 1.33-1.72; FP 1.43-1.54; FPHW 2.00-2.67; FPC 4.77- 7.04; FSP 1.25-1.33.

Larva and host-plant unknown.

Calinda graciliforceps sp. n. (Figs 17e, 20l, 24a, 40a, b, 44f)

Trioza collaris sensu Tuthill, 1944: 158, p. p.; nec Crawford, 1910a.
Trioza longistylus sensu Caldwell, 1941: 422; nec Crawford, 1910a.
Trioza proximata sensu Caldwell, 1941: 422, p. p.; sensu Tuthill, 1945: 1, p. p.; nec Crawford, 1911.

Holotype ♂, Mexico: Hidalgo: Zimapán, 26.ix.1941 (De Long, Good, Caldwell & Plummer), dry mounted (USNM).

Paratypes. Mexico: Distrito Federal: 1 ♂, 4 ♀, Mexico City, 13.ix.1939; 2 ♂, 2 ♀, same but 18 km W Mexico City, 1.ix.1939; 1 ♂, San Jacinto, 30.vi.1932 (D. F. Dampf); 1 ♂, Lomas de Chapultepec, 25.vii.1939 (D. F. Dampf); - Guerrero: 1 ♂, Acapulco road, 8000-9000 ft, 23.xi.1938 (J. S. Caldwell); - Hidalgo: 1 ♂, 2 ♀, same data as holotype; 1 ♀, 17 mi. N Zimapán; - Michoacán: 7 ♂, 9 ♀, 3 km NE Tarecuato, 11.ii.1989, *Baccharis* sp. (D. Hollis); 4 ♂, 2 ♀, 1 km S San Juan Carapan, 12.ii.1989, *Baccharis* sp. (D. Hollis); 3 ♀, 1 ♀, 83 km W Ciudad Hidalgo, 14.ii.1989, *Baccharis* sp. (D. Hollis); dry and slide mounted (BMNH, MHNG, USNM).

U. S. A.: Haiti: 1 ♀, Kenskoff, dry mounted (USNM).

Distribution. Mexico (Distrito Federal, Guerrero, Hidalgo, Michoacán), U. S. A. (Haiti) (CALDWELL 1941 as *T. longistylus* and *T. proximata* p. p.; TUTHILL 1944 as *T. collaris* p. p.; TUTHILL 1945 as *T. proximata* p. p.; present data).

Description. Adult. Male. Head pale green to ochreous, pronotum brownish to ochreous, mesopraescutum and mesoscutum pale green with reddish brown patches, mesoscutellum and metascutellum pale green. Antennal segments 1-3 ochreous, 4-10 dark brown. Legs brownish green. Forewing transparent with brown veins. Female. Head and thorax ochreous, mesopraescutum with reddish brown patches, mesoscutum with reddish brown stripes. Abdomen and genitalia ochreous. Forewing transparent with brown veins. Hindwing transparent.

Forewing subacute apically; vein Rs weakly sinuous; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular, with very short apical process, hindmargin weakly produced. Paramere as long as proctiger, narrow, evenly curved, subacute with small sclerotised tooth apically, medial constriction absent; inner surface covered in thick setae along the hindmargin. Apical dilatation of distal segment of aedeagus short, rounded. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process without dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump medially. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (3): HW 0.55-0.56; AL -; ALHW -; L3/L4 1.69-1.86; LLHW 0.47-0.65; TLHW 1.00-1.02; WL 2.84-2.89; WLHW 5.09-5.44; WLW 2.67-2.77; a/b 1.41-1.65; c/d 1.72-1.83; MP 0.35-0.43; MPHW 0.64-1.03; PL 0.32-0.37; AEL 0.26-0.31. ♀ (2): HW 0.57-0.60; AL 0.84; ALHW 1.47; L3/L4 -; LLHW 0.52-0.60; TLHW 0.90-1.00; WL 3.07-3.44; WLHW 5.11-6.04; WLW 2.69-2.75; a/b 1.51-1.56; c/d 1.75-1.89; FP 0.83-0.87; FPHW 1.45-1.46; FPC 3.77-4.14; FSP 1.16-1.24.

Larva unknown.

Host-plant. Adults were collected on *Baccharis* sp.

Comments. Based on identification labels it seems that TUTHILL'S (1944) *T. collaris* corresponds to *C. graciliforceps*.

Calinda hodkinsoni sp. n. (Figs 15c, 19m, 22g, 32a, b, 42k)

Trioza aguilari sensu Burckhardt, 1988: 157, p. p., nec Tuthill, 1959: 21.
Trioza parviceps sensu Burckhardt, 1988: 160, p. p., nec Tuthill, 1964: 29.

Holotype ♂, Argentina: Salta, Pampa Grande E La Viña, 25°30'S 65°33'W, 26.xi.1983 (L. E. Peña), dry mounted (MHNG).

Paratypes. Argentina: 1 ♂, 2 ♀, same data as holotype; 1 ♂, Tucumán, 450 m, 24-28.i.1905 (S. V. Steinbach); dry and slide mounted (MHNG, NMHU).

Distribution. Argentina (Salta, Tucumán).

Description. Adult. Head, thorax and abdomen black. Antennal segments 1-6 brownish yellow, 7-10 black. Genitalia black, paramere yellow with black apex. Legs brownish yellow. Forewing transparent with brownish yellow veins and radular spinules. Hindwing transparent.

Forewing rounded apically; vein Rs weakly sinuous; costal setae as long as distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, wide triangles. Mesonotum with short setae. Male proctiger, in profile, slender, tubular, with very short apical process, hindmargin almost straight. Paramere shorter than proctiger, wide, truncate with two teeth apically, medial constriction weak; entire inner surface covered in long setae. Apical dilatation of distal segment of aedeagus elongate, with ventro-basal hook which is distant from shaft. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process with dorsal teeth; peg setae dense, present only laterally, regularly spaced. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump medially. Valvula dorsalis short, triangular. Valvula ventralis bearing short, basally well-defined saw.

Measurements: ♂ (1): HW 0.54; AL 1.78; ALHW 2.74; L3/L4 1.89; LLHW 0.98; TLHW 1.39; WL 3.23; WLHW 5.98; WLW 2.50; a/b 1.28; c/d 2.40; MP 0.40; MPHW 0.74; PL 0.35; AEL 0.43. ♀ (1): HW 0.57; AL 1.60; ALHW 2.81; L3/L4 1.59; LLHW 1.09; TLHW 1.37; WL 3.66; WLHW 6.42; WLW 6.42; a/b 1.36; c/d 1.89; FP 1.21; FPHW 2.12; FPC 5.76; FSP 1.15.

Larva and host-plant unknown.

Comments. BURCKHARDT (1988) recorded the species as *Trioza aguilari* and *T. parviceps* from Argentina.

Calinda hollisi sp. n. (Figs 17b, 20h, 23o, 39c-e, 44c)

Holotype ♂, Costa Rica: San José, Zurquí de Moravia, 1600 m, iii.1993, Malaise trap (P. Hanson), dry mounted (BMNH).

Paratypes. Costa Rica: Cartago Province: 5 ♂, 2 ♀, Route 2, 5-10 km S Cartago, 27.ii.1989, *Baccharis trinervis* (D. Hollis); 1 ♀, 6 km S Guatuso, 30.i.1991, *Baccharis trinervis* (D. Hollis); - Guanacaste Province: 18 ♂, 13 ♀, Santa Rosa National Park, San Gabriel track, 20.vi.1989, *Baccharis* sp. (D. Hollis); - San José Province: 1 ♀, Empalme to Santa Maria de Dota road, 2000 m, 11.iv.1992, *Baccharis trinervis* (D. Hollis); 23 ♂, 13 ♀, Zurquí de Moravia, 1600 m, 16.iii.-3.iv.1992, *Baccharis trinervis* (D. Hollis); 3 ♂, 2 ♀, same data as holotype but ii-iv.1991; 1 ♂, 2 ♀, same data but iii-iv.1992; 2 ♂, 2 ♀, same data but ii.1993; 5 ♂, 3 ♀, same data but ii-iv.1993; 2 ♂, 1 ♀, same data but iv-v.1993; 1 ♂, 3 ♀, same data but ii.1994; 6 ♀, same data but iii.1994; 5 ♀, same data but v.1994; 4 ♀, same data but ii.1995; dry, slide mounted and in preserved in alcohol (BMNH, MHNG).

Distribution. Costa Rica (Cartago, Guanacaste and San José Provinces).

Description. Adult. Head, pronotum and thorax ochreous, mesopraescutum with dark brown stripes in the middle and laterally, metascutellum with dark brown patches. Antennal segments 1-4 ochreous, 5-10 dark brown. Abdomen black with light intersegmental membranes. Genitalia ochreous. Forewing transparent with brown veins.

Forewing subacute apically; vein Rs weakly sinuous; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular, without apical process, hindmargin weakly produced. Paramere shorter than proctiger, narrow, truncate apically, with two strongly sclerotised teeth, medial constriction strong; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate with ventral hook which is distant from shaft. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process without dorsal teeth; peg setae sparse, present only laterally, irregularly distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with moderately developed hump in the middle. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (1): HW 0.51; AL 0.96; ALHW 1.88; L3/L4 1.62; LLHW 0.67; TLHW 0.86; WL 2.74; WLHW 5.37; WLW 2.71; a/b 1.38; c/d 2.17; MP 0.32; MPHW 0.63; PL 0.31; AEL 0.25. ♀ (1) HW 0.51; AL 0.92; ALHW 1.80; L3/L4 1.43; LLHW 0.67; TLHW 1.35; WL 3.21; WLHW 6.41; WLW 2,49; a/b 1.49; c/d 1.78; FP 0.94; FPHW1.84; FPC 4.70; FSP1.29.

Larva unknown.

Host-plant. Adults were collected on *Baccharis trinervis* (Lam.) Pers. and *B.* sp.

Calinda huggerti sp. n. (Figs 14f, 19g, 22a, 27c, d, 42d)

Holotype ♂, Ecuador: Napo, Papallacta, 24.ii.1983 (L. Huggert), dry mounted (MZLU).

Paratypes. Ecuador: Napo: 5 ♂, 3 ♀, same data as holotype; 1♀, above Papallacta, 3900 m, 10.ii.1983 (L. Huggert); 1♂, 1 ♀, above Papallacta, 4100 m, 13.iii.1983 (L. Huggert); 1 ♀, N Papallacta, 4000 m, 23.ii.1983 (L. Huggert); 1 ♂, 1 ♀, W Papallacta, 4000 m, 10-23.ii.1983, yellow pan trap (L. Huggert); dry and slide mounted (MZLU, MHNG).

Distribution. Ecuador (Napo).

Description. Adult. Head, pronotum, mesoscutellum and metascutellum ochreous, mesopraescutum ochreous with dark brown stripes in the middle and laterally. Antennal segments 1-4 ochreous, 5-10 dark brown. Abdomen black with whitish intersegmental membranes. Genitalia ochreous. Forewing transparent with brown veins.

Forewing rounded apically; vein Rs more or less straight; costal setae shorter than distance between them. Surface spinules present at the base of cells c+sc, m_2 and the distal portion of cells r_1, m_1 and cu_{1a}; radular spinules forming indistinct patches. Mesonotum with short setae. Male proctiger, in profile, slender, tubular without apical process, hindmargin almost straight. Paramere shorter than proctiger, wide, truncate apically, with two sclerotised apical teeth, weak constriction present in apical third; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate with ventro-basal hook which is close to shaft. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process with dorsal teeth; peg setae dense, present only laterally, regulary spaced. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump in the middle. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (2): HW 0.58-0.62; AL 1.51; ALHW 2.60; L3/L4 1.44; LLHW 0.58-0.74; TLHW 1.06-1.09; WL 2.76-2.91; WLHW 4.70-4.96; WLW 2.69-2.79; a/b 1.18-1.22; c/d 1.83-1.85; MP 0.36-0.39; MPHW 0.58-0.67; PL 0.33-0.35; AEL 0.40. ♀ (2): HW 0.62-0.63; AL 1.18-1.20; ALHW 1.87-1.94; L3/L4 1.41-1.80; LLHW 0.33-0.37; TLHW 1.11-1.16; WL 3.08-3.34; WLHW 4.97-5.27; WLW 1.84-1.90; a/b 1.18-1.25; c/d 1.72-1.94; FP1.01-1.04; FPHW 1.63-1.65; FPC 2.88-3.61; FSP 1.04-1.14.

Larva and host-plant unknown.

Calinda inca sp. n. (Figs 15a, 19k, 22e, 36e, f, 42h)

Holotype ♂, Peru: Ancash: Bandera Blanca, 30.xii.1958 (L. D. Tuthill), slide mounted (USNM).

Paratypes. Peru: 1 ♂, 1 ♀, same data as holotype; slide mounted (USNM, MHNG).

Distribution. Peru (Ancash).

Description. Adult. Male. Head and thorax ochreous, mesopraescutum and mesoscutum with brownish patches. Antennal segments 1-4 ochreous, 5-10 dark brown. Genitalia greenish ochreous. Legs ochreous. Forewing transparent with ochreous veins. Female. Head and thorax ochreous, mesopraescutum and mesoscutum with brownish patches. Antennal segments 1-4 ochreous, 5-10 dark brown. Abdomen greenish ochreous with brown apical projection of proctiger. Legs ochreous. Forewing transparent with ochreous veins.

Forewing bluntly angular apically; vein Rs weakly sinuous; costal setae longer than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular, with very short apical process, hindmargin weakly produced. Paramere as long as proctiger, wide, truncate with two strongly sclerotised teeth apically, medial constriction strong; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate without processes. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process with dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with moderately developed hump medially. Ventral margin very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (2): HW 0.52-0.56; AL 1.15; ALHW 2.05; L3/L4 1.80-2.13; LLHW 0.63-0.77; TLHW 1.02-1.10; WL 2.94-3.50; WLHW 5.65-6.25; WLW 2.88-3.24; a/b 1.40-1.52; c/d 1.78-2.12; MP 0.29; MPHW 0.52-0.55; PL 0.28; AEL 0.22-0.25. ♀ (1): HW 0.54; AL -; ALHW -; L3/L4 1.07; LLHW 0.78; TLHW 1.11; WL 3.56; WLHW 6.59; WLW 2.83; a/b 1.35; c/d 2.28; FP 0.92; FPHW 1.70; FPC 3.68; FSP 1.56.

Larva and host-plant unknown.

Calinda jibara sp. n. (Figs 14a, 21k, 41k)

Holotype ♂, Ecuador: Napo, Papallacta, 24.ii.1983 (L. Huggert), slide mounted (MZLU).

Distribution. Ecuador (Napo).

Description. Adult. Male. Head, pronotum and mesoscutellum ochreous, mesopraescutum and mesoscutum ochreous with brownish patches. Antennal segments 1-4 ochreous, 5-10 dark brown. Genitalia greenish ochreous. Legs ochreous. Forewing transparent with ochreous veins.

Forewing subacute apically; vein Rs in the middle shallowly and evenly curved toward foremargin; costal setae longer than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, wide triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular, with apical process half as long as proctiger wide, hindmargin strongly produced. Paramere longer than proctiger, narrow, bent in the middle, subacute apically with strongly sclerotised tooth, weakly constricted in apical third; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate.

Measurements: ♂ (1): HW 0.60; AL -; ALHW -; L3/L4 1.40; LLHW 0.58; TLHW 1.17; WL 3.31; WLHW 5.52; WLW 2.74; a/b 1.55; c/d 1.84; MP 0.38; MPHW 0.63; PL 0.45; AEL 0.26.

Female, larva and host-plant unknown.

Calinda longicaudata sp. n. (Figs 1a, 17f, 20m, 24b, 38c, d, 44g)

Trioza proximata sensu Caldwell, 1941: 422, p. p.; sensu Tuthill, 1943: 574, 1945: 1, p. p.; Boldt & Robbins, 1994: 52; nec Crawford, 1911.

Holotype ♂, U. S. A.: Arizona, Ramsey Canyon, Huachuca Mts, 30.x.1937 (Oman), dry mounted (USNM).

Paratypes. Mexico: Coahuila: 4 ♂, 4 ♀, Highway 57, 35 mi. SE Saltillo, 27.iv.1990, *Baccharis pteronioides* (P. E. Boldt) (MHNG) dry mounted; - Distrito Federál: 1 ♂, 1 ♀, 18 km W Mexico City, 1.ix.1939; 1♀, San Jacinto, 28.ix.1932 (Alfons Dampf); 2 ♂, 2 ♀, same data but 30.vi.1932; - Hidalgo: 1 ♂, 12 mi. S Jacala, 26.ix.1941 (De Long, Good, Caldwell & Plummer) (USNM); 1 ♂, El Popo Mt., 11,500 ft, 28.ix.1941 (De Long, Good, Caldwell & Plummer) (USNM); - Mexico: 6 ♂, 3 ♀, Ixtapan del Oro, 8.vi.1941, (Alfonso Dampf); 3 ♂, 3 ♀, km 20 Toluca Road, 24.xi.1938 (J. S. Caldwell); - Nuevo León: 1 ♀, C. Agave Vic. Regine, State border Nuevo León and Texas, 7.iii.1960; 4 ♂, 4 ♀, 4 larvae, Highway 61, 8 km N La Ascención, 28.iv.1990, *Baccharis pteronioides* (P. E. Boldt); - Veracruz: 1 ♂, Jalapa, 13.x.1945; (MHNG, USNM) dry and slide mounted.

U.S.A: Arizona: 10 ♂, 12 ♀, same data as holotype; 1 ♂, 1 ♀, same but foothills Huachuca Mts; 1 ♀, Santa Rita Mts, 25.iv.1940 (Oman); - New Mexico: 10 larvae, Grant County, Highway NM 90, 26 mi. E Silver City, 15.vii.1988, *Baccharis pteronioides* (T. O. Robbins; - Texas: 2 ♂, 2 ♀, Jeff Davis County, Highway 166, 20 mi. W Fort Davis, 26.v.1988, *Baccharis pteronioides* (P. E. Boldt); 4 ♂, 6 ♀, same data but CDRI Arboretum, Highway 118, 4 mi. SE Fort Davis, 15.x.1986; 1 ♂, same data but Musquiz Creek; dry and slide mounted (MHNG, USNM).

Distribution. Mexico (Coahuila, Distrito Federal, Hidalgo, México, Nuevo León, Veracruz), U.S.A. (Arizona, New Mexico, Texas) (CALDWELL 1941, p. p.; TUTHILL 1943, 1945, p. p.; BOLDT & ROBBINS 1994; all as *Trioza proximata*; present data).

Description. Adult. Head ochreous. Antennal segments 1-2 brownish ochreous, 3-6 ochreous, 7-10 black. Thorax, abdomen and genitalia brownish ochreous. Forewing transparent with ochreous veins. Hindwing transparent.

Forewing subacute apically; vein Rs in the middle shallowly and evenly curved toward foremargin; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, wide triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular, with short apical process, hindmargin produced. Paramere as long as proctiger, narrow, curved, narrowly rounded apically with one sclerotised tooth, medial constriction absent; inner surface covered in thick setae along hindmargin. Apical dilatation of distal segment of aedeagus elongate. Female proctiger shorter than four times circumanal ring length, straight, pointed apically; apical process without teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump medially. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (3): HW 0.54-0.57; AL 1.06; ALHW 1.86; L3/L4 1.85-2.00; LLHW 0.61-0.74; TLHW 1.05-1.11; WL 2.56-2.63; WLHW 4.61-4.85; WLW 2.45-2.60; a/b 1.29-1.51; c/d 1.52-1.92; MP 0.30; MPHW 0.53-0.69; PL 0.29-0.33; AEL 0.29-0.30. ♀ (3): HW 0.51-0.59; AL 1.04; ALHW 1.82; L3/L4 1.75-2.08; LLHW 0.69-0.75; TLHW 1.09-1.16; WL 2.43-2.66; WLHW 5.07-5.80; WLW 2.43-2.66; a/b 1.36-1.58; c/d 1.61-1.82; FP 1.06-1.09; FPHW 1.80-2.40; FPC 6.05-6.75; FSP 0.98-1.11.

Fifth instar larva. Brown with lighter abdominal base. Body elongate, abdomen relatively narrow and slightly angled apically. Abdominal margin with long lanceolate setae, apex with few dorsal lanceolate setae. Abdominal apex with a pair of indistinct tubercles. Circumanal ring developed, small, angular.

Host-plant. The larvae develop in the flower heads of *Neomolina pteronioides* (DC.) Hellwig (= *Baccharis pteronioides*).

Comments. According to collection labels, plants of *Neomolina pteronioides* in New Mexico were heavily infested by *C. longicaudata* and its parasites.

Calinda longicollis sp. n. (Figs 16d, 20a, 23b, 25e, f, 43h)

Holotype ♂, Ecuador: Napo, Papallacta, 24.ii.1983 (L. Huggert), dry mounted (MZLU).

Paratypes. Ecuador: Napo: 1 ♀, same data as holotype; 1 ♀, above Papallacta, 4100 m, 13.iii.1983 (L. Huggert); 1 ♂, Quito - Baeza Road, 4100 m, iii.1983 (L. Huggert); dry and slide mounted (MHNG, MZLU).

Distribution. Ecuador (Napo).

Description. Adult. Head, pronotum, mesopraescutum and mesoscutum black with brownish yellow stripes, mesoscutellum ochreous, metascutellum and metapseudonotum dark brown sometimes with ochreous stripes. Antennal segments 1-2 brownish yellow, 3-5 yellow, 6-10 black. Abdomen black; basal and apical portions of paramere black, the rest ochreous. Legs brownish yellow, tarsi black. Forewing yellowish with brownish yellow veins. Hindwing transparent.

Forewing subacute apically; vein Rs in the middle shallowly and evenly curved toward foremargin; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular, with very short apical process, hindmargin strongly produced. Paramere as long as proctiger, lamellar in basal two thirds, tapering in apical third with forward directed, sclerotised tooth apically, without medial constriction; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate with ventro-basal hook which is distant from shaft. Female proctiger longer than four times circumanal ring length, truncate apically; apical process without dorsal teeth; peg setae dense, present only laterally, regularly spaced. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump medially. Valvula dorsalis short, triangular. Valvula ventralis long, straight without apical saw.

Measurements: ♂ (1): HW 0.57; AL -; ALHW -; L3/L4 1.67; LLHW 0.61; TLHW 1.35; WL 3.27; WLHW 5.74; WLW 2.84; a/b 1.52; c/d 1.82; MP 0.39; MPHW 0.68; PL 0.36; AEL 0.36. ♀ (1): HW 0.62; AL -; ALHW -; L3/L4 1.57; LLHW 0.58; TLHW 1.27; WL 3.64; WLHW 5.87; WLW 1.82; a/b 1.36; c/d 1.92; FP 0.97; FPHW 1.56; FPC 4.04; FSP 1.33.

Larva and host-plant unknown.

Calinda longistylus (Crawford), comb. n., stat. rev. (Figs 3a, 4a, 18a, 20q, 24f, 36a, b, 44l)

Trioza longistylus Crawford, 1910a: 233. Lectotype ♀, U. S. A.: Colorado (Baker) (USNM), here designated (examined); Crawford, 1911: 434; Crawford, 1914: 82; Tuthill, 1943: 575. Synonymised with *T. collaris* by Tuthill, 1944: 159.

Trioza collaris sensu Crawford, 1914: 81, p. p.; Boldt & Robbins, 1994: 50; nec Crawford, 1910a.

Material examined. U.S.A.: Arizona: 1 ♂, Littlefield, 14.iii.1930, *Pluchea sericea* (D. E. Fox), 148 B-30; 1 ♀, Santa Cruz River near Tubac, 23.x.1937 (Oman); 1 ♂, 1 ♀, Santa Rita, iv.1935 (Oman); 1 ♀, same data but Sasabe, x.1937; 1 ♂, Tucson 27.viii.1938 (D. J. & J. N. Knull); 1 ♂, 3 ♀, Tumicacari, 22.vii.1938 (B. H. Beamer); 1 ♂, Huachuca Mountains, 9.ix.1938 (D. J & J. N. Knull); - California: 1 ♂, 1 ♀, Los Altos, 24.i.19 (W. M. Giffard); 2 ♂, same data but Santa Clara County, 20.v.1927; 2 ♂, Mount Springe, 25.vii.1938 (B. H. Beamer); 4 ♂, 3 ♀, San Francisco, 8.iv.1927 (E. D. Ball); 4 ♀, same data but 20.vi.1935 (Oman); 1 ♂, Sacramento, 25.x.1928, Alfalfa (C. C. Wilson); 5 ♂, 8 ♀, Salinas, 8.iv.1926 (E. D. Ball); 2 ♂, 8 ♀, Santa Cruz Mountains (A. Koebele); 3 ♂, 1 ♀, same data but viii.;1 ♂, 1 ♀, same data but 13.viii.1938 (R. H. Beamer); 1 ♀, Keene Camp, 24.v.1946 (A. J. & J. N. Knull); 2 ♂, 2 ♀, Santa Rosa Mountains, 27.v.1946 (D. J. & J. N. Knull); 3 ♂, Argus Mts, x, 91 km (A. Koeble Collection) (USNM) dry mounted; - Nevada: 1 ♂, Glendale, 16.xii.1929, *Pluchea sericea* (D. E. Fox) (USNM); - New Mexico: 1 ♂, Mesilla Park, National Monument, 7.xi.1938 (Christenson); 1 ♂, same data but 21.iv.1909; 1 ♀, Dona Ana County, 16.v.1969, *Tamarix* sp. (D. Liensen); 4 ♂, 4 ♀, Eddy County, 4 mi. E Loving, Pecos River, 13.iv.1989, *Baccharis salicina* (P. E. Boldt); 1 ♂, same data but 22.viii.1988; 8 ♂, 9 ♀, same data but Highway 31, 4 mi. E Loving, 2.v.1988; 4 ♂, 4 ♀, same data but Eddy County, Lincoln National forest, Sitting

Bull Falls, *Baccharis salicina* (P. E Bolt); 2 ♂, 2 ♀, 2 larvae, same data but 16.viii.1989 (T. O. Robbins); 1 ♂, 2 ♀, Eddy County, 4 mi. N Malaga, 19.viii.1968, *Tamarix* sp. (D. Liensen); - Texas: 2 ♂, Jeff Davis County, Fort Davis, Limpia Creek, 19.ix.1986, *Baccharis salicifolia* (P. E. Boldt); - without locality data: 2 ♀, D. L. Crawford collection; dry and slide mounted (MHNG, USNM).

Distribution. U. S. A. (Arizona, California, Nevada, New Mexico, Texas) (CRAWFORD 1911, 1914; TUTHILL 1943; BOLDT & ROBBINS 1994, as *T. collaris*; present data).

Description. Adult. Head ochreous. Antennal segments 1-6 brownish ochreous, 7-10 brown. Mesopraescutum and mesoscutum ochreous with brown patches, mesoscutellum and metascutellum ochreous. Legs and abdomen brownish ochreous. Genitalia ochreous with black apex. Forewing ochreous with brown bands along the veins, radular spinules brown. Hindwing transparent.

Forewing bluntly angular apically; vein Rs abruptly bent towards foremargin in the middle; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, wide triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular, with short apical process, hindmargin moderately produced. Paramere shorter than proctiger, narrow, evenly curved, subacute with heavily sclerotised tooth apically, medial constriction absent; inner surface covered in thick setae along hindmargin. Apical dilatation of distal segment of aedeagus shortly oval, with ventro-basal hook which is close to shaft. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process without dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump medially. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (3): HW 0.59-0.67; AL 1.02-1.13; ALHW 1.62-1.92; L3/L4 1.83-1.85; LLHW 0.64-0.81; TLHW 0.94-1.02; WL 3.22-3.42; WLHW 5.10-5.46; WLW 2.70-2.80; a/b 1.30-1.58; c/d 1.64-1.88; MP 0.33-0.38; MPHW 0.49-0.64; PL 0.37-0.40; AEL 0.29-0.31. ♀ (2): HW 0.62-0.67; AL 0.91; ALHW 1.47; L3/L4 1.77-2.00; LLHW 0.64-0.67; TLHW 0.87-0.90; WL 3.28-3.54; WLHW 5.28-5.29; WLW 2.72-2.83; a/b 1.29-1.33; c/d 1.78-1.91; FP 0.78-0.83; FPHW 1.24-1.26; FPC 4.58-4.61; FSP 1.00-1.08.

Fifth instar larva. Straw-coloured with brown intersegmental membranes. Body elongate, abdomen relatively broad and evenly rounded apically. Abdominal margin with long lanceolate setae, apex with few dorsal lanceolate setae. Abdominal apex without teeth. Circumanal ring developed, small, angular.

Host-plant. Larvae were collected in the flower heads of *Baccharis salicina* Torr. & Gray, adults also on *Pingraea salicifolia* (Ruiz & Pavón) Hellwig (= *Baccharis salicifolia*).

Comments. TUTHILL (1944) synonymised *C. longistylus* with *C. collaris* from which it differs in the presence of yellowish or ochreous bands along the veins of the forewing, and in details of the male and female genitalia (see keys). CALDWELL's (1941) records of *T. longistylus* concern *C. graciliforceps*.

Calinda magniforceps (Tuthill), comb. n. (Figs 13b, 18h, 21b, 26a, b, 41b)

Trioza magniforceps Tuthill, 1964: 29. Holotype ♂, Peru: Cuzco, 13.vi.1959, *Baccharis* sp. (L. D. Tuthill) (USNM) (examined).

Material examined. Peru: Cuzco: 1 holotype ♂, 8 ♂, 8 ♀ paratypes, Cuzco, 13.vi.1959, *Baccharis* sp. (L. D. Tuthill); 1 ♂, 2 ♀, 8 km S Cuzco, 3500 m, 6.viii.1971 (C. & M. Vardy), B. M. 1971-533; 3 ♂, 1 ♀, Sacsayhuaman, 3900 m, 5.viii.1971 (C. & M. Vardy), B.M. 1971-533; dry and slide mounted (BMNH, MHNG, USNM).

Distribution. Peru (Cuzco) (TUTHILL 1964; HODKINSON & WHITE 1981; present data).

Description. Adult. Head and thorax ochreous, mesoscutum with reddish brown stripes. Antennal segments 1-5 ochreous, 6-10 dark brown. Abdomen ochreous with sometimes almost black dorsum. Genitalia ochreous. Legs ochreous. Forewing yellowish with brown veins. Hingwing transparent.

Forewing subacute apically; vein Rs weakly sinuous; costal setae as long as distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, posteriorly strongly produced in basal quarter, with apical process half as long as proctiger wide. Paramere shorter than proctiger, triangular with subapical carina and digitiform antero-apical process, inner surface covered in setae in apical half and along hindmargin. Apical dilatation of distal segment of aedeagus elongate with membranous projection. Female genitalia globular, proctiger shorter than four times circumanal ring length, straight, pointed apically; apical process with dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Ventral margin of female subgenital plate without apical process. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (1): HW 0.60; AL -; ALHW -; L3/L4 1.65; LLHW -; TLHW 1.45; WL 3.27; WLHW 5.45; WLW 2.52; a/b 1.41; c/d 1.50; MP 0.46; MPHW 0.77; PL 0.43; AEL 0.35. ♀ (1): HW 0.62; AL -; ALHW -; L3/L4 1.54; LLHW -; TLHW 1.02; WL 3.32; WLHW 5.35; WLW 2.61; a/b 1.39; c/d 1.73; FP 1.04; FPHW 1.68; FPC 2.41; FSP 1.96.

Larva unknown.

Host-plant. Adults were collected on *Baccharis* sp.

Calinda mendocina (Kieffer & Jörgensen), comb. n., stat. rev. (Figs 17a, 20g, 23n, 34e, f, 44b)

Cecidotrioza mendocina Kieffer & Jörgensen, 1910: 372. Syntypes ♂, ♀ and galls, Argentina: Province Mendoza, Pedregal and Chacras de Coria, xii-vi., *Baccharis salicifolia* (P. Jörgensen) (destroyed). Synonymised with *Trioza testacea* (Blanchard) by Burckhardt, 1988: 155.

Cecidotrioza mendozina; Burckhardt, 1988: 155, misspelling.

Trioza testacea/aguilari-complex, Form B, p. p. Burckhardt, 1988: 159.

Material examined. Argentina: Catamarca: 1 ♂, 1 ♀, Andalhuallas, 2000 m, 19.i.1968 (Golbach, Terán & Willink); - Mendoza: 29 ♂, 18 ♀, Mendoza Valley, Uspallata, 1900 m, 30.xii.1995, *Pingraea salicifolia* (D. Burckhardt) #29(3); 4 ♂, 4 ♀, same data but Uspallata to Potrerillos, 1700 m, 30-31.xii.1995, #30(2); - Neuquén: 1 ♂, 50 km N Chos Malal, 8.xii.1983 (L. E. Peña); - Río Negro: 1 ♂, El Bolsón, 22.iv.1961, (Topál), Nr. 410; - Salta: 2 ♂, 1 ♀, 2500 m, 12.xii.1905 (S. V. Steinbach); dry and slide mounted, and preserved in alcohol (BMNH, FMLT, MHNG, NHMB, NMHU, USNM).

Distribution. Argentina (Catamarca, Mendoza, Neuquén, Río Negro, Salta) (KIEFFER & JÖRGENSEN 1910; present data).

Description. Adult. Head and thorax yellow to ochreous, sometimes mesopraescutum with reddish patches. Antennal segments 1-4 ochreous, 5-10 dark brown. Legs and abdomen ochreous. Genitalia light green. Forewing transparent with ochreous veins.

Forewing subacute apically; vein Rs weakly sinuous; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular, with short apical process, posterior margin moderately produced. Paramere as long as proctiger, slender, truncate with two teeth apically, hindmargin strongly inflated in basal half, medial constriction moderate; entire inner surface covered in setae, with thick setae along hindmargin. Apical dilatation of distal segment of aedeagus elongate, with small ventro-basal toothlet close to shaft. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process with dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump in the middle. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (5): HW 0.56-0.65; AL 0.84-1.05; ALHW 1.45-1.88; L3/L4 1.46-1.92; LLHW 0.54-0.83; TLHW 0.88-1.04; WL 2.55-3.21; WLHW 4.40-5.63; WLW 2.60-2.71; a/b 1.21-1.53; c/d 1.43-2.07; MP 0.31-0.35; MPHW 0.53-0.61; PL 0.31-0.39; AEL 0.31-0.41. ♀ (3): HW 0.56-0.59; AL 1.01; ALHW 1.71-1.74; L3/L4 1.90-2.00; LLHW 0.57-0.63; TLHW 0.89-1.05; WL 3.18-3.34; WLHW 5.55-5.76; WLW 2.45-2.90; a/b 1.51-1.64; c/d 0.91-1.61; FP 0.76-0.84; FPHW 1.36-1.42; FPC 4.00-4.32; FSP 1.02-1.07.

Larva unknown.

Host plant. The larva induces galls in the flower heads of *Pingraea salicifolia* (Ruiz & Pavón) Hellwig (= *Baccharis salicifolia*) (Kieffer & Jörgensen, 1910).

Comments. The original description of *C. mendocina* is poor and the type material is lost (BURCKHARDT 1987a, 1988). KIEFFER & JÖRGENSEN'S (1910) drawing of the male genitalia shows a postero-basally inflated paramere. Material recently collected in the Mendoza Valley near the type localities and on the same host shares this feature. This suggests, contrary to BURCKHARDT (1988), that *C. mendocina* is specifically distinct from *C. testacea*. In addition, *C. mendocina* is restricted to *P. salicifolia* whereas *C. testacea* is monophagous on *P. sphaerocephala*. The latter does not grow in the Mendoza Region.

Calinda microcephala sp. n. (Figs 15h, 19q, 22m, 31c, d, 43c)

Holotype ♂, Ecuador: Napo, above Papallacta, 4100 m,13.iii.1983 (L. Huggert), dry mounted (MZLU).

Paratypes. Ecuador: Napo: 5 ♂, same data holotype; 1 ♂, 1 ♀, above Papallacta, 3900 m, 10.ii.1983 (L. Huggert); 1 ♂, 1♀, N Papallacta, 4100 m, 14.ii.1983 (L. Huggert); 1 ♀, Papallacta, 24.ii.1983 (L. Huggert); 1 ♂, W of Papallacta, 4000 m, 10-23.ii.1983, yellow pan trap (L. Huggert); 3 ♂, Quito - Baeza Road, 4100 m, iii.1983 (L. Huggert); dry and slide mounted (MHNG, MZLU).

Distribution. Ecuador (Napo).

Description. Adult. Male. Head light brown, pronotum brownish yellow with dark brown patches, mesopraescutum and mesoscutum dark brown and brownish yellow laterally, mesoscutellum yellow. Antennal segments dark brown. Legs, abdomen and genitalia light yellow. Forewing and hindwing transparent. Female. Head and thorax ochreous, mesopraescutum with brown stripes, mesoscutum brownish ochreous. Antennal segments 1-2 yellowish brown, 3-10 black. Abdomen brown. Genitalia ochreous with apical process brown. Legs ochreous with black tarsi. Forewing transparent with brownish yellow veins. Hindwing transparent.

Forewing rounded apically; vein Rs in the middle shallowly and evenly curved toward foremargin; costal setae longer than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with long setae. Male proctiger, in profile, slender, tubular, without apical process, straight posteriorly. Paramere shorter than proctiger; wide, truncate apically, with two heavily sclerotised apical teeth; weakly constricted in apical quarter; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate and with ventro-basal hook which is distant from shaft. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process with dorsal teeth; peg setae dense, present dorsally and laterally, regularly spaced. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump in the middle. Valvula dorsalis short, triangular. Valvula ventralis bearing short, basally well-defined saw.

Measurements: ♂ (1): HW 0.58; AL -; ALHW -; L3/L4 0.70; LLHW -; TLHW 1.45; WL 4.03; WLHW 6.95; WLW 2.44; a/b 1.48; c/d 1.77; MP 0.47; MPHW 0.81; PL 0.37; AEL 0.43. ♀ (1): HW 0.59; AL -; ALHW -; L3/L4 1.05; LLHW 0.81; TLHW 1.44; WL 4.29; WLHW 7.27; WLW 2.49; a/b 1.42; c/d 1.72; FP 1.42; FPHW 2.41; FPC 5.07; FSP 1.06.

Larva and host-plant unknown.

Calinda muiscas sp. n. (Figs 18f, 20v, 24l, 45d)

Holotype ♂, Peru: Cuzco, Ollantaytambo, 19.xii.1983 (L. Huggert), dry mounted (MZLU).

Paratype. Peru: 1 ♂, Cuzco, 13.vi.1959 (L. D. Tuthill), slide mounted (USNM).

Distribution. Peru (Cuzco).

Description. Adult. Male. Head and thorax brownish ochreous. Antennal segments 1-4 ochreous, 5-10 dark brown. Legs, abdomen and genitalia ochreous, paramere brownish ochreous. Forewing yellowish transparent with ochreous veins.

Forewing subacute apically; vein Rs weakly sinuous; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, wide triangles. Mesonotum with short setae. Male proctiger, in profile, slender, tubular, with very short apical process, weakly produced posteriorly. Paramere shorter than proctiger, spiniform, broadened subapically, subacute apically, with strongly sclerotised tooth; inner surface covered in setae in apical half. Apical dilatation of distal segment of aedeagus elongate and with ventro-basal hook which is distant from shaft.

Measurements: ♂ (1): HW 0.50; AL -; ALHW -; L3/L4 2.14; LLHW 0.66; TLHW1.14; WL 2.73; WLHW 5.46; WLW 2.79; a/b 1.36; c/d 2.00; MP 0.37; MPHW 0.74; PL 0.35; AEL 0.40.

Female, larva and host-plant unknown.

Calinda osorii sp. n. (Figs 13d, 18k, 21d, 36c, d, 41d)

Holotype ♂, Colombia: Boyaca, Sogamoso, 29.v.1946 (E. A. Chapin), station 46-23, dry mounted (USNM).

Paratypes. Colombia: 54 ♂, 23 ♀, same data as holotype; dry and slide mounted (MHNG, USNM).

Distribution. Colombia (Boyaca).

Description. Adult. Head brownish yellow, pronotum and mesoscutellum ochreous, mesopraescutum and mesoscutum with reddish brown stripes. Antennal segments 1-4 ochreous, 5-10 dark brown. Abdomen brownish ochreous. Legs and genitalia ochreous. Forewing yellowish with ochreous veins.

Forewing subacute apically; vein Rs weakly sinuous; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, wide triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular, with apical process half as long as proctiger wide. Paramere shorter than proctiger, wide basally, strongly narrowed apically, with strongly sclerotised, forward directed apical tooth; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate without processes. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process without dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump medially. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (3): HW 0.51-0.64; AL 1.14-1.28; ALHW 2.24-2.37; L3/L4 1.73-2.00; LLHW 0.73-0.82; TLHW 1.16-1.23; WL 3.23-3.36; WLHW 6.22-6.33; WLW 0.66-0.79; a/b 1.46-1.51; c/d 1.69-1.81; MP 0.36-0.41; MPHW 0.66-0.79; PL 0.31-0.34; AEL 0.25-0.28. ♀ (3): HW 0.54-0.60; AL 1.14-1.28; ALHW 2.06-2.24;

L3/L4 1.57-2.08; LLHW 0.63-0.72; TLHW 1.02-1.20; WL 3.60-3.71; WLHW 6.03-6.77; WLW 2.25-2.63; a/b 1.46-1.54; c/d 1.72-1.95; FP 1.04-1.07; FPHW 1.78-1.95; FPC 4.52-4.65; FSP 1.49-1.62.

Larva and host-plant unknown.

Calinda otavalo sp. n. (Figs 15i, 19r, 22n, 31a, b, 43d)

Holotype ♂, Ecuador: Napo, Papallacta, 3700 m, 25.ii.1983 (L. Huggert), dry mounted (MZLU).

Paratypes. Ecuador: Napo: 1 ♂, 11 ♀, same data as holotype; 2 ♀, above Papallacta, 4100 m, 13.iii.1983 (L. Huggert); dry and slide mounted (MHNG, MZLU).

Distribution. Ecuador (Napo).

Description. Adult. Head yellow. Antennal segments 1-2 dark brown, 3-10 black. Thorax ochreous, mesopraescutum and mesoscutum with light brown stripes. Legs and abdomen ochreous, genitalia yellow, paramere with black apex. Forewing transparent with brownish yellow veins. Hindwing transparent.

Forewing subacute apically; vein Rs in the middle shallowly and evenly curved toward foremargin; costal setae longer than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, slender, tubular, without apical process, straight posteriorly. Paramere shorter than proctiger, wide, truncate apically, with two apical sclerotised teeth, medial constriction strong; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate, with ventro-basal hook which is close to shaft. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process with dorsal teeth; peg setae dense, present dorsally and laterally, regularly spaced. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump in the middle. Valvula dorsalis short, triangular. Valvula ventralis bearing short, basally well-defined saw.

Measurements: ♂ (3): HW 0.56-0.62; AL 2.04-2.08; ALHW 1.22-1.57; L3/L4 1.22-1.57; LLHW 0.79-1.78; TLHW 1.40-1.61; WL 3.90-4.05; WLHW 6.29-7.18; WLW 2.58-2.65; a/b 0.56-1.30; c/d 1.98-2.26; MP 0.45-0.51; MPHW 0.74-0.85; PL 0.37-0.44; AEL 0.45-0.47. ♀ (5): HW 0.56-0.65; AL 1.60-2.11; ALHW 2.80-3.35; L3/L4 1.23-2.83; LLHW 0.51-1.09; TLHW 1.43-1.60; WL 3.86-4.50; WLHW 6.89-7.38; WLW 2.43-2.54; a/b 1.27-1.48; c/d 1.96-2.24; FP 1.46-1.63; FPHW 2.24-2.72; FPC 3.36-5.46; FSP 1.03-1.35.

Larva and host-plant unknown.

Calinda panamensis (Brown & Hodkinson), comb. n. (Figs 3b, 4c, 16b, 19t, 22p, 30c, d, 43f)

Trioza panamensis Brown & Hodkinson, 1988: 228. Holotype ♂, Panama: Chiriquí, Volcán Baru, 3200-3475 m, 20.v.1977 (H. & W. Wolda), #3a-13, slide mounted (USNM) (examined).

Material examined. Costa Rica: 2 ♂, 2 ♀, San José, Zurquí de Moravia, 1600 m, ii.1993, malaise trap (P. Hanson); 2 ♂, 2 ♀, same data but iii-iv.1993; 1 ♂, same data, but vi-vii.1993; 10 ♂, 5 ♀, same data but ii.1994; 1 ♂, 4 ♀, same data but iii.1994; 1 ♂, 1 ♀, same data but iv.1994; 25 ♂, 29 ♀, same data but ii.19956 ♂, 4 ♀, Cerro de la Muerte, Villa Mills, 3000 m, 23.vi.1989, *Pentacalia andicola* (D. Hollis); 4 ♂, 3 ♀, same data but 21.iii.-5.iv.1992; dry, slide mounted and in alcohol (BMNH, MHNG).

Panama: holotype ♂, Chiriquí, Volcán Baru, 3200-3475 m, 20.v.1977 (H. & W. Wolda) #3a-13 (USNM).

Distribution. Costa Rica (San José), Panama (Chiriquí).

Description. Adult. Male. Head brownish yellow, thorax black dorsally. Antennal segments 1-5 brownish yellow, 6-10 dark brown. Abdomen brown. Legs brownish ochreous. Forewing transparent with brown veins. Female. Head and pronotum brownish yellow, mesopraescutum ochreous with brown patches centrally, mesopraescutum brownish yellow with dark brown stripes, mesoscutellum yellow. Antennal segments 1-4 brownish yellow, 5-10 dark brown. Abdomen brownish yellow with dark brown intersegmental membranes. Genitalia brownish yellow. Forewing transparent with brown veins.

Forewing subacute apically; vein Rs in the middle shallowly and evenly curved toward foremargin; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with long setae. Male proctiger, in profile, thick, tubular; without apical process, hindmargin weakly produced. Paramere shorter than proctiger, wide, truncate apically with two strongly sclerotised teeth, medial constriction weak; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate with ventro-basal hook which is distant from shaft. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process with dorsal teeth; peg setae dense, present only laterally, regularly spaced. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump in the middle. Valvula dorsalis short, triangular. Valvula ventralis bearing long, basally indistinctly defined saw.

Measurements: ♂ (2): HW 0.50-0.63; AL 1.43; ALHW 2.65; L3/L4 1.70; LLHW 0.62-0.76; TLHW 1.24; WL 3.23-3.65; WLHW 5.79-5.98; WLW 2.47-2.48; a/b 1.25-1.29; c/d 1.54-1.95; MP 0.35; MPHW 0.56-0.65; PL 0.28; AEL 0.31-0.37. ♀ (1): HW 0.55; AL 1.49; ALHW 2.71; L3/L4 1.85; LLHW 0.69; TLHW 1.29; WL 3.43; WLHW 6.24; WLW 2.60; a/b 1.48; c/d 1.92; FP 0.84; FPHW 1.53; FPC 3.50; FSP 1.24.

Larva unknown.

Host-plant. *Pentacalia andicola* (Turcz.) (BMNH data).

Calinda parviceps (Tuthill), comb. n. (Figs 15b, 19l, 22f, 31e, f, 42i)

Trioza parviceps Tuthill, 1964: 29. Holotype ♂, Peru: Cuzco, 13.vi.1959, *Senecio rudbeckiafolius* (L. D. Tuthill), dry mounted (USNM) (examined).

Material examined. Peru: 1 holotype ♂, 8 paratypes, Cuzco, 13.vi.1959, *Senecio rudbeckiafolius* (L. D. Tuthill); dry and slide mounted (USNM).

Distribution. Peru (Cuzco) (TUTHILL 1964; HODKINSON & WHITE 1981).

Description. Adult. Head reddish brown, pronotum ochreous, mesopraescutum reddish brown with ochreous borders, mesoscutum reddish brown, mesoscutellum ochreous. Antennal segments 1-5 ochreous, 6-10 dark brown. Abdomen ochreous and brown, paramere reddish brown. Legs ochreous. Forewing transparent with brown veins.

Forewing subacute apically; vein Rs in the middle shallowly and evenly curved toward foremargin; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with long setae. Male proctiger, in profile, thick, tubular, without apical process, hindmargin almost straight. Paramere shorter than proctiger, wide, truncate apically, with two apical teeth, strongly constricted in apical third; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate with ventro-basal hook which is close to shaft. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process with dorsal teeth; peg setae dense, present dorsally and laterally, regulary spaced. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump in the middle. Valvula dorsalis short, triangular. Valvula ventralis bearing short, basally well-defined saw.

Measurements: ♂ (1): HW 0.54; AL -; ALHW -; L3/L4 1.59; LLHW 0.83; TLHW 1.16; WL 3.23; WLHW 5.98; WLW 2.65; a/b 1.31; c/d 2.10; MP 0.38; MPHW 0.70; PL 0.31; AEL 0.35. ♀ (1): HW 0.53; AL -; ALHW -; L3/L4 1.56; LLHW 0.81; TLHW 1.26; WL 3.36; WLHW 6.34; WLW 2.33; a/b 0.91; c/d 1.79; FP 0.98; FPHW 1.84; FPC 4.26; FSP 1.06.

Larva unknown.

Host-plant. Adults were collected on *Senecio rudbeckiafolius* Meyen & Walp (Tuthill, 1964).

Comments. The records of *T. parviceps* from Argentina and Bolivia (BURCKHARDT 1988) concern *C. hodkinsoni* and *C. reversyi* respectively.

Calinda patagonica sp. n. (Figs 15e, 19o, 22i, 28c, d, 42m)

Holotype ♂, Chile: XII Reg., Prov. Ultima Esperanza, Parque Nacional Torres del Paine, Laguna Azul, 400 m. 14.i.1991, *Senecio patagonicus* (D. Burckhardt), #39b, slide mounted (MHNG).

Paratypes. Chile: XII. Reg.: 5 ♀, 7 larvae, same data as holotype; 6 larvae, same data but Laguna Mellizas to Lago Toro, 0-100 m, 3.i.1991, #38; 7 larvae, same data but Lago Grey, Río Pingo, 100 m, 12.i.1991 #37b; 2 larvae, same data but km 140-150 on Punta Arenas to Punta Delgada Road, 0-50 m, 18.i.1991, #46; dry and slide mounted (MHNG).

Distribution. Chile (XII Reg.).

Description. Adult. Head dark yellow. Antennal segments 1-2 yellowish brown, 3-7 yellow, 8-10 black. Pronotum and mesoscutellum dark yellow, mesopraescutum and mesoscutum brown greenish, the latter with dark reddish brown stripes. Abdomen yellowish brown with black stripes, proctiger dark brown and subgenital plate yellowish brown. Legs brownish yellow with black patches, tarsi black. Forewing yellowish with dark brown veins. Hindwing transparent.

Forewing subacute apically; vein Rs in the middle shallowly and evenly curved toward foremargin; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, wide triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular; without apical process, hindmargin weakly produced. Paramere as long as proctiger, wide, truncate apically, with two apical teeth, antero-apically obliquely truncate, postero-apically strongly produced, medial constriction weak; entire inner surface covered in fine setae. Apical dilatation of distal segment of aedeagus elongate with ventro-basal hook which is distant from shaft. Female proctiger shorter than four times circumanal ring length, pointed apically; apical process with dorsal teeth; peg setae dense, present only laterally, regularly spaced. Circumanal ring not extended distally. Ventral margin of female subgenital plate with large hump in the middle. Valvula dorsalis short, triangular. Valvula ventralis bearing short, basally well-defined saw.

Measurements: ♂ (1): HW 0.53; AL -; ALHW -; L3/L4 1.46; LLHW 0.84; TLHW 1.09; WL 2.60; WLHW 4.90; WLW 2.77; a/b 1.33; c/d 1.50; MP 0.33; MPHW 0.62; PL 0.33; AEL 0.35. ♀ (1): HW 0.51; AL -; ALHW -; L3/L4 1.58; LLHW 0.84; TLHW 1.10; WL 2.65; WLHW 5.20; WLW 2.48; a/b 1.31; c/d 1.62; FP 0.76; FPHW 1.60; FPC 5.00; FSP 1.04.

Fifth instar larva. Entirely dark brown to black, several specimens lighter. Body elongate, abdomen very broad and evenly rounded apically. Abdominal margin without lanceolate setae, at most with a few fine setae, apex without dorsal lanceolate setae. Abdominal apex without teeth. Circumanal ring reduced to a few pores.

Host-plant. The larvae develop in the flower heads of *Senecio patagonicus* Hooker & Arnett where they produce galls.

Calinda pehuenche sp. n. (Figs 16i, 20f, 23m, 35a, b, 44a)

Holotype ♂, Chile: IX Reg., Prov. Malleco, Alto San José, 4 km N Traiguén, 5.viii.1995 (T. Olivares), dry mounted (NHMB).

Paratypes. Chile: V Reg.: 1 ♀, Putaendo, 10 km N San Felipe, 700 m, 17.v.1993, *Pingraea salicifolia* (D. Burckhardt), #10(1); - Reg. Metropolitana: 1 ♂, Reg., between Corral Quemado and Farellones, 1700 m, 19.v.1993, *Pingraea salicifolia* (D. Burckhardt), #14(1); - VIII Reg.: 5 ♂, 5 ♀, Culenco, Santa Juana to Nacimiento, 1.v.1996, *Baccharis* sp. (Garrido); 4 ♂, 2 ♀, Puente Arinco, Santa Juana, 80 km S Concepción, 12.v.1996, *Baccharis* sp. (Garrido); 8 ♂, 7 ♀, San José, Santa Juana to Nacimiento, 84 km S Concepción, 12.v.1996, *Baccharis* sp. (Garrido); 6 ♂, 10 ♀, Puente San Juan 1, Villa los Boldos, km 33 Concepción to Florida / Villa San Ramón Road, 9.vi.1996, *Baccharis* sp. (Garrido); - IX Reg.: 1 ♂, 1 ♀, same data as holotype; 1 ♂, 4 ♀, same data but 3 km N Traiguén road to Victoria, 7.viii.1995, *Baccharis* sp.; dry and slide mounted, and preserved in alcohol (MHNG, NHMB).

Distribution. Chile (V Reg., Reg. Metropolitana, VIII and IX Reg.).

Description. Adult. Head brownish yellow, pronotum light yellow, mesopraescutum and mesoscutum with brownish yellow stripes, mesoscutellum yellow.

Antennal segments 1-2 brownish yellow, 3 light yellow, 4-10 brownish yellow. Abdomen black. Legs and genitalia brownish yellow. Forewing yellowish with brownish yellow veins.

Forewing bluntly angular apically; vein Rs weakly sinuous; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular with very short apical process, hindmargin weakly produced. Paramere shorter than proctiger, narrow, truncate apically, with two apical teeth, medial constriction strong, hindmargin in basal half strongly produced; inner surface along hindmargin with a band of thick setae. Apical dilatation of distal segment of aedeagus elongate, with small ventro-basal hook which is close to shaft. Female proctiger longer than four times circumanal length, straight, pointed apically; apical process without dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump medially. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (12): HW 0.57-0.62; AL 0.91-1.11; ALHW 1.52-1.79; L3/L4 1.25-2.88; LLHW 0.56-0.86; TLHW 0.84-1.02; WL 298-3.27; WLHW 4.85-5.36; WLW 2.59-3.03; a/b 1.25-1.72; c/d 1.19-1.56; MP 0.34-0.43; MPHW 0.57-0.70; PL 0.33-0.37; AEL 0.29-0.32. ♀ (10): HW 0.62-0.65; AL 0.99-1.11; ALHW 1.57-1.79; L3/L4 1.42-1.82; LLHW 0.53-0.76; TLHW 0.84-1.00; WL 3.12-3.46; WLHW 5.08-5.49; WLW 1.84-2.81; a/b 1.42-1.77; c/d 1.31-1.67; FP 0.85-0.93; FPHW 1.31-1.48; FPC 3.00-4.09; FSP 1.01-1.33.

Larva unknown

Host-plant. Adults were collected on *Pingraea salicifolia* (Ruiz & Pavón) Hellwig.

Calinda penai sp. n. (Figs 14c, 19d, 21m, 41m)

Holotype ♂, Chile: I Reg., Tarapacá, Belén, 18°21'S 69°31'W, 3400 m, 12.xi.1983 (L. E. Peña), dry mounted (MHNG).

Paratypes. Chile: I Reg.: 4 ♂, same data as holotype; 1 ♂, 1 ♀, Putre, viii.1965, Chilca (= *Baccharis* sp.) (H. Vargas); dry and slide mounted (MHNG, USNM).

Distribution. Chile (I Reg.).

Description. Adult. Head, thorax and abdomen ochreous, mesopraescutum with yellowish brown stripes, mesoscutum with black longitudinal stripes, mesoscutellum yellow. Antennal segments 1-5 ochreous, 6-10 brown. Paramere brownish yellow, male proctiger and subgenital plate yellow. Legs ochreous, tarsi black. Forewing transparent with ochreous veins. Hindwing transparent.

Forewing subacute apically; vein Rs weakly sinuous; costal setae as long as distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, quadrate with short apical process. Paramere longer than proctiger, narrow, subacute with sclerotised tooth apically, medial constriction weak; inner surface covered in setae in the centre and in apical half. Apical dilatation of distal segment of aedeagus elongate without process. Female genitalia as in *C. gibbosa* but processes of proctiger and subgenital plate slightly longer.

Measurements: ♂ (1): HW 0.70; AL -; ALHW -; L3/L4 1.77; LLHW 0.77; TLHW 1.29; WL 4.18; WLHW 5.97; WLW 5.97; a/b 1.54; c/d 1.70; MP 0.31; MPHW 0.44; PL 0.57; AEL 0.34.

Larva unknown.

Host-plant. Adults have been collected on *Baccharis* sp.

Comments. The record of *T. gibbosa* from Chile (Burckhardt 1988) concerns *C. penai*.

Calinda peruana (Tuthill), comb. n. (Figs 13c, 18i, 21c, 26c, d, 41c)

Trioza peruana Tuthill, 1959: 21. Holotype ®, Peru: Huánuco, near San Rafael, 31.xii.1958, *Baccharis* sp. (L. D. Tuthill) (USNM) (examined).

Material examined. Peru: holotype ♂, 21 paratypes, Huánuco, near San Rafael, 2300 m, 31.xii.1958, *Baccharis* sp. (L. D. Tuthill); 1 ♀, Ancash, Monterrey Baños, 23.xi.1958 (L. D. Tuthill); dry and slide (USNM).

Distribution. Peru (Ancash, Huánuco, Lima) (Tuthill 1959; Hodkinson & White 1981)

Description. Adult. Head brownish ochreous, pronotum ochreous, mesopraescutum with two brown to reddish brown stripes, mesocutum ochreous with six brown stripes, mesoscutellum ochreous. Antennal segments 1-9 ochreous, 10 black. Abdomen with genitalia ochreous. Legs ochreous. Forewing transparent to yellowish with ochreous veins.

Forewing subacute apically; vein Rs in the middle shallowly and evenly curved toward foremargin; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, wide triangles. Mesonotum with short setae. Male proctiger, in profile, thick, hindmargin strongly expanded in basal half, with apical process half as long as proctiger wide. Paramere shorter than proctiger, wide, truncate apically with a subapical carina and digitiform antero-apical process; medial constriction absent; inner surface covered in setae in the centre and laterally. Apical dilatation of distal segment of aedeagus elongate with membranous projection. Female genitalia globular, proctiger shorter than four times circumanal ring length, straight, pointed apically; apical pocess with dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate strongly rounded, with very short apical process. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (1): HW 0.56; AL 1.17; ALHW 2.09; L3/L4 1.87; LLHW 0.63; TLHW 1.16; WL 2.96; WLHW 5.29; WLW 2.79; a/b 1.42; c/d 1.67; MP 0.43; MPHW 0.76; PL 0.31; AEL 0.31. ♀ (1): HW 0.56; AL -; ALHW -; L3/L4 1.62; LLHW 0.55; TLHW 1.04; WL 3.08; WLHW 5.50; WLW 2.77; a/b 1.53; c/d 1.51; FP 0.88; FPHW 1.57; FPC 4.40; FSP 1.66.

Larva unknown.

Host-plant. Adults were collected on *Baccharis* sp.

Calinda peterseni sp. n. (Figs 1d, 3c, 4d, 14g, h, 19h, 22b, c, 28a, b, 42e, f)

Holotype ♂, Chile: XII Reg., Prov. Ultima Esperanza, Paso de la Laguna Dorotea, W Puerto Natales, 250 m, 10.xii.1995, *Senecio tricuspidatus* (D. Burckhardt), #33, dry mounted (MHNG).

Paratypes. Chile: XII Reg.: 47 ♂, 53 ©, same data as holotype; 7 ♂, 7 ♀, Prov. Ultima Esperanza, Monumento Natural Cueva del Milodón, 150 m, 11.i.1991, *Senecio tricuspidatus* (D. Burckhardt), #34; 1 ♀, Prov. Ultima Esperanza, Parque Nacional Torres del Paine, Laguna Azul, 400 m, 14.i.1991, *Senecio tricuspidatus* (D. Burckhardt), #39b; 7 ♀, Prov. Magallanes, Estación La Cumbre, Sierra Baguales, 5.xii.1987, *Senecio* sp. (J. Petersen C.); 1 ♂, Magallanes, Reserva Natural Magallanes, 27.xii.1978-26.i.1979, *Senecio* sp. (J. Petersen C.); 1 ♀, same data but 20-24.xi.1978; dry and slide mounted (BMNH, MHNG, NHMB, USNM).

Distribution. Chile (XII Reg.).

Description. Adult. Male. Head, thorax and legs light yellowish brown, mesopraescutum with light brown suboval patch. Proctiger light yellowish brown; paramere light brown with black apex; subgenital plate dark brown. Forewing yellowish with dark brown veins and light brown radular spinules. Hindwing transparent. Female. Head, pronotum, mesopraescutum and mesoscutum ochreous with four brownish patches, mesoscutellum yellow, abdomen and genitalia ochreous. Antennal segments 1-4 yellow, 5-10 black. Legs yellow with black tarsi. Forewing including veins yellow.

Forewing subacute apically, vein Rs more or less straight; costal setae shorter than distance between them; surface spinules present in cells c + sc and at base of cells r_2, m_2 and cu_2, absent from apical portions of wing; radular spinules forming well-defined, wide triangles. Mesonotum with short setae. Male proctiger, in profile, slender, tubular, without apical process, hindmargin weakly produced. Paramere shorter than proctiger, wide, truncate with two teeth apically; medial constriction weak; entire inner surface covered in fine setae. Apical dilatation of distal segment of aedeagus elongate with ventro-basal hook which distant from shaft. Female proctiger shorter than four times circumanal ring length, subacute apically; apical process with dorsal teeth; peg setae dense, present only laterally, regularly spaced. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump medially. Valvula dorsalis short, triangular. Valvula ventralis bearing short, basally well-defined saw.

Measurements: ♂ (6): HW 0.48-0.58; AL 0.88-0.90; ALHW 1.40-1.66; L3/L4 1.27-1.55; LLHW 0.22-0.28; TLHW 0.87-1.04; WL 2.30-2.54; WLHW 4.21-4.85; WLW 1.95-2.51; a/b 1.03-2.07; c/d 1.47-1.91; MP 0.27-0.31; MPHW 0.52- 0.60; PL 0.23-0.26; AEL 0.29-0.32. ♀ (6): HW 0.55-0.61; AL 0.83-0.90; ALHW 1.43-1.64; L3/L4 1.25-1.60; LLHW 0.22-0.27; TLHW 0.85-0.96; WL 2.63-2.83; WLHW 4.61-4.87; WLW 2.29-2.55; a/b 1.44-1.60; c/d 1.60-1.89; FP 0.75-0.77; FPHW 1.26-1.38; FPC 3.80-4.05; FSP 1.12-1.25.

Larva unknown.

Host-plant. Adults were collected on *Senecio tricuspidatus* Hooker & Arnett.

Calinda plaumanni sp. n. (Figs 17g, 20n, 24c, 40e, f, 44h)

Holotype ♂, Brazil: Santa Catarina, Nova Teutonia, 23.vi.1943 (F. Plaumann), B.M.1957-341, dry mounted (BMNH).

Paratypes. Brazil: 1 ♂, 18 ♀, same data as holotype; 1 ♀, Rio de Janeiro, SE Brazil, Serra do Alto Itatiaya [= Agulhas Negras], 21.ii.1922 (E. G. Holt); dry and slide mounted (BMNH, MHNG, USNM).

Distribution. Brazil (Rio de Janeiro, Santa Catarina).

Description. Adult. Male. Head, pronotum, mesoscutum and mesoscutellum ochreous. Antennal segments 1-4 ocheous, 5-10 brownish. Abdomen and genitalia ochreous. Legs yellow with black tarsi. Forewing transparent with yellowish veins. Hindwing transparent. Female. Head and thorax yellow to ochreous. Antennal segments 1-3 ochreous, 4-10 brownish. Genitalia ochreus with brownish apical projection. Legs ochreous. Forewing and hindwing transparent.

Forewing subacute apically; vein Rs more or less straight; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, slender, tubular, without apical process, hindmargin almost straight. Paramere shorter than proctiger, narrow, subacute apically, with anteriorly directed sclerotised tooth; medial constriction absent; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate without processes. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process without dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with moderately developed hump medially. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (1): HW 0.47; AL -; ALHW -; L3/L4 -; LLHW 0.79; TLHW 1.26; WL 2.44; WLHW 5.19; WLW 2.68; a/b 1.54; c/d 1.65; MP 0.34; MPHW 0.72; PL 0.27; AEL 0.24. ♀ (2): HW 0.49-0.56; AL -; ALHW -; L3/L4 1.66-2.09; LLHW 0.67-0.79; TLHW 1.10-1.14; WL 2.76-3.53; WLHW 5.63-6.30; WLW 2.71-3.21; a/b 1.47-1.51; c/d 1.40-1.81; FP 0.72-0.79; FPHW 1.41-1.47; FPC 4.16-4.80; FSP 1.22-1.24.

Larva and host-plant unknown.

Calinda proximata (Crawford), comb. n. (Figs 13h, 21h, 39a, b, 41h)

Trioza proximata Crawford, 1911: 424, 435. Lectotype ♂, Mexico: Oaxaca (C. F. Baker) (USNM) (examined), here designated.

Material examined. Mexico: lectotype ®, 1 ®, 3 ©, paralectotypes, Oaxaca (C. F. Baker); 1 © paralectotype, Orizaba (C. F. Baker); dry and slide mounted (USNM).

Distribution. Mexico (Oaxaca) (CRAWFORD 1911, 1914; TUTHILL 1943).

Description. Adult. Body yellowish ochreous to almost white, light greenish yellow. Antennae black apically. Female genitalia black. Forewing transparent.

Forewing rounded apically; vein Rs abruptly bent towards foremargin in the middle; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular, with short apical process, hindmargin produced. Paramere as long as proctiger, narrow, curved, subacute with sclerotised tooth apically, without medial constriction; inner surface covered in thick setae along hindmargin. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process without dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump medially. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (1) HW 0.58; AL -; ALHW -; L3/L4 1.93; LLHW 0.59; TLHW 1.09; WL 3.51; WLHW 6.05; WLW 2.90; a/b 1.55; c/d 1.73; MP 0.40; MPHW 0.69; PL 0.35; AEL -. ♀ (1): HW 0.61; AL -; ALHW -; L3/L4 1.93; LLHW 0.62; TLHW 1.07; WL 3.16; WLHW 5.18; WLW -; a/b -; c/d -; FP 0.90; FPHW 1.48; FPC 3.33; FSP 0.82.

Larva and host-plant unknown.

Comments. CALDWELL's (1941) record of *T. proximata* concerns *C. longicaudata* and *C. graciliforceps*. *T. proximata* was recorded from Arizona on *Baccharis bigelovii* by BOLDT & ROBBINS (1994); this material may belong to an additional undescribed species.

Calinda reversyi sp. n. (Figs 15f, 22k)

Trioza parviceps sensu Burckhardt, 1988: 160, figs 11f, k, p, 12b, p. p., nec Tuthill, 1964: 29.

Holotype ♂, Bolivia: Potosí, Lecori, S Potosí, 3200 m, 26-27.xii.1984 (L. E. Peña), slide mounted (MHNG).

Paratype. Bolivia: 1 ♂, Chuquisaca/Tarija, Padcoyo to Camargo, 2800-3200 m, 26-28.xii.1984 (L. E. Peña), slide mounted (MHNG).

Distribution. Bolivia (Chuquisaca, Potosí, Tarija).

Description. Adult. Head, thorax and abdomen mostly brown, mesonotum with lighter logitudinal stripes. Antennal segments 1 and 2 brown, 3 and 4 yellowish, 5-10 light brown. Forewing transparent with ochreous veins.

Forewing subacute apically; vein Rs in the middle shallowly and evenly curved toward foremargin; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, wide triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular; without apical process, hindmargin weakly produced. Paramere as long as proctiger, wide, truncate and with two teeth apically, postero-apically slightly produced, medial constriction weak; entire inner surface covered in fine setae. Apical dilatation of distal segment of aedeagus elongate with ventro-basal hook which is distant from shaft.

Measurements: ♂ (2): HW 0.53; AL 0.91; ALHW 1.65; L3/L4 1.54-2.00; LLHW 0.70-0.85; TLHW 1.04; WL 2.75; WLHW 5.19-5.29; WLW 2.43-258; a/b 1.33-1.36; c/d 1.33-2.06; MP 0.33-0.40; MPHW 0.62-0.73; PL 0.29-0.30; AEL 0.33-0.37.

Female, larva and host-plant unknown.

Comments. The record of *T. parviceps* from Bolivia (BURCKHARDT 1988) concerns *C. reversyi*.

Calinda salicifoliae sp. n. (Figs 13e, 18l, 21e, 35f, g, 41e)

Holotype ♂, Chile: V Reg., Los Patos, 35 km N San Felipe, 100 m, 17.v.1993, *Pingraea salicifolia* (D. Burckhardt), #11(2), dry mounted (MHNG).

Paratypes. Chile: IV Reg.: 1 ♂, 1 ♀, 31 km W Ovalle, 19.ii.1985, *Baccharis* sp. (D. Hollis); 2 ♂, 1 ♀, Ovalle, Valle del Encanto, 17.ii.1985, *Baccharis linearis* ssp. *linearis* (D. Hollis); 2 ♂, Parque Nacional Fray Jorge, foot of Hill, 18.ii.1985, *Baccharis linearis* ssp. *linearis* (D. Hollis); - V Reg.: 3 ♂, Parque Nacional La Campana, 1100 m, 11.i.1985 (D. Hollis); 12 ♂, 6 ♀, 1 larva, same data as holotype; 1 ♂, Putaendo, 10 km N San Felipe, 700 m, 17.v.1993, *Pingraea salicifolia* (D. Burckhardt); 9 ♂, 12 ♀, Prov. Petorca, El Guayacan, 20 km E Cabildo, 800 m, 17.v.1993, *Baccharis* sp. (D. Burckhardt), #12(1); 1 ♂, 1 ♀, Quillota, Fundo Francesco Araya, 5.v.1993, *Pingraea salicifolia* (D. Burckhardt), #7(1); - Reg. Metropolitana: 10 ♂, 6 ♀, between Corral Quemado and Farellones, 1700 m, 19.v.1993, *Baccharis* sp. (D. Burckhardt), #14(1); dry and slide mounted (BMNH, MHNG).

Distribution. Chile (IV, V Reg., Reg. Metropolitana).

Description. Adult. Head, mesopraescutum and mesoscutellum ochreous. Antennal segments 1-8 ochreous, 9-10 dark brown. Pronotum and mesoscutum ochreous with reddish brown stripes, metascutellum dark brown. Abdomen dark brown. Genitalia and legs ochreous. Forewing transparent with ochreous veins. Hindwing transparent.

Forewing subacute apically; vein Rs abruptly bent towards foremargin in the middle; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, wide triangles. Mesonotum with short setae. Male proctiger covered in long setae, in profile, thick, tubular, with apical process half as long as proctiger wide, hindmargin strongly produced. Paramere as long as proctiger, narrow and straight, subacute apically, with strongly sclerotised apical tooth, without medial constriction; inner surface densely covered in thick setae. Apical dilatation of distal segment of aedeagus elongate without processes. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process with dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump medially. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (6): HW 0.51-0.58; AL 0.85-0.86; ALHW 1.47-1.59; L3/L4 1.64-2.88; LLHW 0.48-0.76; TLHW 0.78-0.88; WL 2.39-2.90; WLHW 4.44-5.09; WLW 2.60-3.00; a/b 1.29-1.54; c/d 1.52-1.70; MP 0.30-0.35; MPHW 0.55-0.69; PL

0.34-0.39; AEL 0.21-0.23. ♀ (6): HW 0.54-0.61; AL 0.81; ALHW 1.50; L3/L4 1.45-3.57; LLHW 0.41-0.69; TLHW 0.78-0.93; WL 2.58-2.96; WLHW 4.69-5.24; WLW 2.52-2.64; a/b 1.19-1.56; c/d 1.38-1.66; FP 0.65-1.16; FPHW 1.18-1.52; FPC 3.53-4.47; FSP 1.29-1.60.

Fifth instar larva. Brown, abdomen ochreous with brown depressions. Body elongate, abdomen narrowly rounded apically. Abdominal margin with moderately long lanceolate setae, apex with a few dorsal lanceolate setae. Abdominal apex without teeth, indented in the middle. Circumanal ring absent.

Host-plant. *Pingraea salicifolia* (Ruiz & Pavón) Hellwig, adults were also collected on *Baccharis linearis* (Ruiz & Pavón) Pers. ssp. *linearis* (Ruiz & Pavón) Pers. and *B.* sp.

Calinda simoni (Tuthill), comb. n. (Figs 18d, 20t, 24i, 38a, b, 45b)

Trioza simoni Tuthill, 1959: 22. Holotype ®, Peru: Junin, slope of Palca, 31.xii.1958, *Baccharis* sp. (L. D. Tuthill) (USNM) (examined).

Material examined. Peru: holotype ®, 12 paratypes, Junin, slope of Palca, 31.xii.1958, *Baccharis* sp. (L. D. Tuthill) (USNM); 1 ®, Cuzco, Sacsayhuaman, 3900 m, 5.viii.1971 (C. & M. Vardy) B.M.1971-533; dry and slide mounted (BMNH, USNM).

Distribution. Peru (Cuzco, Junin, Lima) (Tuthill 1959; Hodkinson & White 1981; present data).

Description. Adult. Male. Head yellow, pronotum ochreous, mesopraescutum yellow with black stripes, mesoscutellum yellow, metascutellum black. Antennal segments 1-8 brownish ochreous, 9-10 black. Abdomen black with yellow intersegmental membranes. Genitalia yellow with brown paramere. Legs brownish yellow. Forewing yellowish with ochreous veins. Female. Head yellow, pronotum ochreous, mesopraescutum yellow with black stripes, mesoscutellum yellow, metascutellum black. Antennal segments 1-8 brownish ochreous, 9-10 black. Abdomen greenish. Genitalia greenish with brown apical projection. Legs brownish yellow. Forewing yellowish with ochreous veins.

Forewing subacute apically; vein Rs weakly sinuous; costal setae longer than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, quadrate, without apical process. Paramere longer than proctiger, narrow, subacute apically, with sclerotised anteriorly directed apical tooth, medial constriction weak; inner surface covered in setae in apical half. Apical dilatation of distal segment of aedeagus elongate with membranous subacute apex. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process with dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump medially. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (1): HW 0.58; AL -; ALHW -; L3/L4 -; LLHW 0.66; TLHW 1.22; WL 3.69; WLHW 6.36; WLW 2.81; a/b 1.77; c/d 1.77; MP 0.31; MPHW 0.53;

PL 0.36; AEL 0.20. ♀ (1): HW 0.64; AL -; ALHW -; L3/L4 1.90; LLHW 0.64; TLHW 1.17; WL 3.98; WLHW 6.22; WLW 2.71; a/b 1.63; c/d 1.86; FP 1.05; FPHW 1.64; FPC 5.00; FSP 1.44.

Larva unknown.

Host-plant. Adults were collected on *Baccharis* sp.

Calinda spatulata sp. n. (Figs 14e, 19f, 21o, 30e, f, 42c)

Holotype ♂, Ecuador: Napo, Papallacta, 24.ii.1983 (L. Huggert), dry mounted (MZLU).

Paratypes. Ecuador: Napo: 24 ♂, 32 ♀, same data as holotype; 1 ♀, above Papallacta, 10.ii.1983 (L. Huggert); dry and slide mounted (MHNG, MZLU).

Distribution. Ecuador (Napo).

Description. Adult. Head dark brown with vertex, foveae and coronal suture black. Antennal segments 1 black, 2-5 dirty yellow, 6-10 black. Pronotum and mesopraescutum dirty yellow. Abdomen, ochreous. Subgenital plate black, paramere black, proctiger dirty yellow. Legs brownish yellow, tarsi black. Forewing yellowish with brownish yellow veins.

Forewing rounded apically; vein Rs in the middle shallowly and evenly curved toward foremargin; costal setae longer than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, wide triangles. Mesonotum with long setae. Male proctiger, in profile, thick, tubular, with very short apical process, hindmargin strongly produced. Paramere shorter than proctiger, widely lanceolate in profile, subacute apically, with posteriorly directed tooth, medial constriction absent; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate and with ventro-basal hook which is distant from shaft. Female proctiger longer than four times circumanal ring length, pointed apically; apical process with dorsal teeth; peg setae dense, present dorsally and laterally, regularly spaced. Circumanal ring not extended distally. Ventral margin of female subgenital plate with flattened hump medially. Valvula dorsalis triangular. Valvula ventralis long, straight without apical saw.

Measurements: ♂ (3): HW 0.68-0.75; AL 1.85-2.39; ALHW 2.47-3.27; L3/L4 1.77-2.21; LLHW 0.69-0.81; TLHW 1.28-1.38; WL 4.14-4.31; WLHW 5.52-6.25; WLW 2.42-2.62; a/b 1.33-1.54; c/d 1.38-1.76; MP 0.41-0.47; MPHW 0.52-0.60; PL 0.36-0.40; AEL 0.38-0.39. ♀ (3): HW 0.72-0.74; AL 1.91-2.00; ALHW 2.59-2.74; L3/L4 1.61-1.89; LLHW 0.58-0.90; TLHW 1.30-1.33; WL 4.62-4.91; WLHW 6.33-6.64; WLW 2.44-2.54; a/b 1.34-1.40; c/d 1.33-1.56; FP 0.99-1.05; FPHW 1.38-1.42; FPC 3.50-4.13; FSP 1.24-1.33.

Larva and host-plant unknown.

Calinda testacea Blanchard, comb. rev. (Figs 1c, e, 3d, 4b, 5b-d, 6b-e, 17d, 20k, 23q, 37f, g, 44e)

Calinda testacea Blanchard, 1852: 310. Lectotype ♂, Chile: San Carlos (MNHN), slide mounted (examined).

Calinda nigromaculata Blanchard, 1852: 311. Lectotype ♀, Chile: Valdivia (MNHN), slide mounted (examined); synonymised by Burckhardt, 1988: 155.
Trioza testacea; Burckhardt, 1988: 155.

Material examined. Chile: VIII Reg.: lectotype ♂ of *Calinda testacea*, San Carlos; - X Reg.: lectotype ♀ of *Calinda nigromaculata*, Valdivia; 1 ♂, 1 ♀, Rincón de la Piedra, 20 km SE Valdivia, 31.i.1985, *Baccharis* sp. (D. Hollis); 1 ♂, 17-21 km Valdivia to Curiñanco Road, 200-400 m, 28-30.xii.1990, *Drimys winteri* (Agosti & Burckhardt), #23; 4 ♂, 2 ♀, same data but *Pingraea sphaerocephala*; 2 ♂, 2 ♀, Antuco near Puyehue, 4.ii.1985, *Baccharis patagonica* ssp. *palenae* (D. Hollis); 8 ♂, 16 ♀, 7 larvae, Prov. Osorno, Aguas Calientes, near Puyehue, 500 m, 1-3.ii.1996, *Pingraea sphaerocephala* (D. Burckhardt), #71(9); 7 ♂, 3 ♀, Pucatrihue, near Bahía Mansa, 2.ii.1985 *Baccharis* sp. (D. Hollis); 1 ♂, Prov. Chiloé, Chiloé Island, Al Pacífico road, near Castro, 7.ii.1985 (D. Hollis); 3 ♂, 1 ♀, same but 42 km N Castro, 9.ii.1985 *Baccharis* sp. (D. Hollis); 4 ♂, 4 ♀, same but Huillinco to Cucao road, 6.ii.1985, *Baccharis* sp. (D. Hollis); 3 ♂, same but Chepu, 19.ii.1991 (T. Cekalovic); 12 ♂, 12 ♀, same but Parque Nacional Chiloé, Cucao 30 km SW Castro, 10-70 m, 28.ii.1992, *Pingraea sphaerocephala* (D. Burckhardt), #34a(5); 4 ♂, 13 ♀, 1 exuvia, same but Parque Nacional Chiloé, Rancho Grande, Río Cypresal, 0-150 m, 8.ii.1996 (D. Burckhardt), #80(4); 2 ♂, 2 ♀, 2 larvae, same but Cucao to Huillinco Road, 42°29'S 74°03'W, 50 m, 16.i.1994, *Pingraea sphaerocephala* (D. Burckhardt), #57; 1 ♂, 1 ♀, same but Chaitén, 14.ii.1989 (T. Cekalovic); 7 ♂, 7 ♀, Prov. Llanquihue, Parque Nacional Alerce Andino, Laguna Chaiquenes, 200-350 m, 3-6.i.1993, *Pingraea sphaerocephala* (D. Burckhardt), #36a(2); dry and slide mounted, and preserved in alcohol (BMNH, MHNG, MNHN).

Distribution. Chile (VIII and X Reg.).

Description. Adult. Head and thorax yellowish green. Antennal segments 1-2 brownish yellow, 3-6 yellow, 7-10 black. Pronotum green, mesopraescutum and mesoscutum with reddish brown stripes. Legs and abdomen yellowish green. Genitalia yellow, paramere yellow with black apex. Forewing yellowish with light brown veins. Hindwing transparent.

Forewing subacute apically; vein Rs in the middle shallowly and evenly curved toward foremargin; costal setae as long as distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, narrow triangles. Mesonotum with short setae. Male proctiger, in profile, thick, tubular, with very short apical process, hindmargin moderately produced. Paramere shorter than proctiger, narrow, truncate and slightly expanded apically, with a subapical carina and each an anterior and posterior toothlet, medial constriction absent; entire inner surface sparsely covered in setae. Apical dilatation of distal segment of aedeagus elongate with ventro-basal hook which is distant from shaft. Female proctiger longer than four times circumanal ring length, straight, pointed apically; apical process without dorsal teeth; peg setae sparse, present only laterally, irregulary distributed. Circumanal ring not extended distally. Ventral margin of female subgenital plate with moderately developed hump medially. Valvula dorsalis very long, bearing short apical incision. Valvula ventralis with long, basally indistinctly defined saw.

Measurements: ♂ (15) HW 0.51-0.57; AL 0.91-1.09; ALHW 1.72; L3/L4 1.16-2.36; LLHW 0.49-0.83; TLHW 0.93-1.52; WL 2.56-3.17; WLHW 4.94-5.74; WLW 2.42-3.03; a/b 1.23-2.37; c/d 1.59-2.17; MP 0.28-0.47; MPHW 0.54-0.87; PL 0.31-0.35; AEL 0.24-0.30. ♀ (12): HW 0.50-0.59; AL 0.81-1.02; ALHW 1.50-2.00;

L3/L4 1.85-2.40; LLHW 0.44-1.00; TLHW 1.00-1.17; WL 2.51-3.63; WLHW 5.02-6.44; WLW 2.45-2.85; a/b 1.30-1.52; c/d 1.45-1.94; FP 0.84-1.22; FPHW 1.71-2.20; FPC 3.94-6.00; FSP 1.77-2.51.

Fifth instar larva. Brown; meso and metathorax and abdominal margin dark brown, membranes ligther; thoracic dorsum yellowish, abdominal dorsum ochreous to ligth brown. Body elongate, abdomen relatively narrow and angular apically. Abdominal margin with moderately long lanceolate setae, apex with a group of dorsal lanceolate setae. Abdominal apex with two conspicuous teeth. Circumanal ring absent.

Host-plant. The larvae live in the flowerheads of *Pingraea sphaerocephala* (Hooker & Arnett) Hellwig; adults were also collected on *Baccharis patagonica* Hook. & Arn. ssp. *palenae* (Phil.) Hellwig and *B*. sp.

Calinda trinervis sp. n. (Figs 16c, 19u, 23a, 25c, d, 43g)

Trioza sp. A, Brown & Hodkinson, 1988: 228.

Holotype ♂, Costa Rica: San José, Zurquí de Moravia, 1600 m, iii.1994, Malaise trap (P. Hanson), dry mounted (BMNH).

Paratypes. Costa Rica: Cartago Province: 10 ♂, 12 ♀, Route 2, 5-10 km S Cartago, 27.ii.1989, *Baccharis trinervis* (D. Hollis); 1 ♂, 2 ♀, 6 km S Guatuso, 30.i.1991, *Baccharis trinervis* (D. Hollis); - San José Province: 4 ♂, 1 ♀, 19km S, 3 km W Empalme, 2600 m, iii-vii.1992, Malaise trap (P. Hansen); 1 ♂, Empalme to Santa Maria de Dota road, 2000 m, 11.iv.1992, *Baccharis trinervis* (D. Hollis); 3 ♂, 3 ♀, Zurquí de Moravia, 1600 m, 16.iii.-3.iv.1991, *Baccharis trinervis* (D. Hollis); 1 ♂, 3 ♀, same data as holotype but iii-iv.1991; 2 ♂, 1 ♀, same data but iii-iv.1993; 2 ♂, same data but iv-v.1993; 2 ♀, same data but ii.1994; 1 ♂, 1 ♀, same data but iii.1994; 2 ♂, same data but iv.1994; 1 ♂, 2 ♀, same data but ii.1995; 1 ♂, same data but iii.1995; dry and slide mounted (BMNH).

Distribution. Reported as *Trioza* sp. A. from Panama (Chiriquí) (BROWN & HODKINSON 1988), Costa Rica (Cartago and San José Provinces) (present data).

Description. Adult. Male. Head and thorax ochreous, mesopraescutum with brown patches, mesoscutum with light brown patches. Antennal segments 1-5 ochreous, 6-10 dark brown. Abdomen brown with light intersegmental membranes. Paramere brown apically. Legs ochreous. Forewing transparent with brown veins. Female. Head ochreous. Antennal segments 1-4 brownish ochreous, 5-10 light brown. Thorax ochreous, mesopraescutum with brown patches, mesoscutum with light brown stripes. Abdomen brown, genitalia ochreous, intersegmental membranes light. Legs ochreous. Forewing transparent with brown veins.

Forewing subacute apically; vein Rs in the middle shallowly and evenly curved toward foremargin; costal setae shorter than distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, wide triangles. Mesonotum with short setae. Male proctiger, in profile, slender, tubular, with short apical process. Paramere shorter than proctiger, narrow, curved forward apically forming heavily sclerotised tooth, with flat subapical lobe along the outer foremargin, medial constriction absent; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate with ventro-basal tooth which is close to shaft. Female proctiger longer than four times circumanal ring length, truncate apically, without dorsal teeth apically; peg setae dense, present only laterally, regularly spaced. Circumanal ring not extended distally. Ventral margin of female subgenital plate angled medially. Valvula dorsalis short, triangular. Valvula ventralis long, truncate apically.

Measurements: ♂ (1): HW 0.51; AL 1.15; ALHW 2.55; L3/L4 1.79; LLHW 0.55; TLHW 1.14; WL 2.99; WLHW 5.86; WLW 2.64; a/b 1.39; c/d 2.19; MP 0.34; MPHW 0.67; PL 0.41; AEL 0.32. ♀ (1): HW 0.55; AL 1.25; ALHW 2.27; L3/L4 1.59; LLHW 0.75; TLHW 1.13; WL 3.28; WLHW 5.96; WLW 2.69; a/b 1.34; c/d 2.11; FP 0.93; FPHW 1.69; FPC 3.88; FSP 1.33.

Larva unknown.

Host-plant. Adults were collected on *Baccharis trinervis* (Lam.) Pers.

Calinda tuthilli sp. n. (Figs 13i, 19b, 21i, 41i)

Holotype ♂, Peru: Lima, Rimac Valley, km 115, 19.xii.1958 (L. D. Tuthill), slide mounted (USNM).

Paratype. Peru: 1 ♂, Cajamarca, 1 mi. SW of town, 8000 ft, 26.viii.1971, shrubs on hillside, fertile Valley in Andes (P. S. & H. L. Broomfield), B.M.1971-486, slide mounted (BMNH).

Distribution. Peru (Cajamarca, Lima).

Description. Adult. Male. Head and thorax ochreous, mesopraescutum and mesoscutum with light brownish stripes, abdomen and genitalia ochreous. Antennal segments 1-5 ochreous, 6-10 dark brown. Forewing transparent with brown veins.

Forewing subacute to narrowly rounded apically; vein Rs weakly sinuous; costal setae shorter than distance between them. Surface spinules absent except for base of cell cu_2; radular spinules forming well-defined, wide triangles. Mesonotum with short setae. Male proctiger, in profile, thick, hindmargin strongly produced in basal two thirds, with long apical process though less than half as long as proctiger wide. Paramere as long as proctiger, narrow, subacute apically with sclerotised tooth, medial constriction absent; entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate.

Measurements: ♂ (2): HW 0.54-0.55; AL -; ALHW -; L3/L4 1.90-2.07; LLHW 0.62, TLHW 0.94-1.00; WL 2.39-3.15; WLHW 4.43-5.73; WLW 2.57-2.86; a/b 1.49-1.59; c/d 1.34-1.70; MP 0.32-0.36; MPHW 0.59-0.65; PL 0.32-0.36; AEL 0.18-0.20.

Female, larva and host-plant unknown.

Calinda velardei (Tuthill), comb. n. (Figs 13g, 19a, 21g, 25a, b, 41g)

Trioza velardei Tuthill, 1959: 23. Holotype ♂, Peru: Huánuco, Tulca, above Acomayo, 30.xii.1958, *Baccharis humifusa* (L. D. Tuthill) (USNM) (examined).

Material examined. Peru: holotype ♂, 16 paratypes, Huánuco, Tulca, above Acomayo, 30.xii.1958, *Baccharis humifusa* (L. D. Tuthill); dry and slide mounted (USNM).

Distribution. Peru (Huánuco) (Tuthill 1959; Hodkinson & White 1981).

Description. Adult. Head and thorax ochreous, mesopraescutum, mesoscutum, mesoscutellum and metascutellum with reddish brown patches. Antennal segments 1-5 ochreous, 6-10 dark brown. Legs ochreous. Forewing brownish with ochreous veins.

Forewing subacute apically; vein Rs weakly sinuous; costal setae shorter than distance between them. Surface spinules covering entire surface of wing, except for narrow stripes along the veins; radular spinules forming indistinct patches. Mesonotum with short setae. Male proctiger, in profile, thick, tubular, with short apical process less than half as long as proctiger wide, hindmargin moderately produced. Paramere shorter than proctiger, narrow, subacute apically with sclerotised hook, medial constriction absent; inner surface covered in setae in apical half. Apical dilatation of distal segment of aedeagus elongate with ventro-basal hook which is distant from shaft. Female proctiger longer than four times circumanal ring length; upturned and pointed apically; dorsal margin without teeth; peg setae dense, present only laterally, regularly spaced. Circumanal ring not extended distally. Ventral margin of female subgenital plate shallowly angular in the middle. Valvula dorsalis short, triangular. Valvula ventralis long, truncate apically.

Measurements ♂ (1): HW 0.47; AL -; ALHW -; L3/L4 2.00; LLHW -; TLHW 1.00; WL 2.26; WLHW 4.81; WLW 2.76; a/b 1.66; c/d 1.35; MP 0.30; MPHW 0.64; PL 0.28; AEL 0.27. ♀ (1): HW 0.52; AL -; ALHW -; L3/L4 2.50; LLHW 0.67; TLHW 1.04; WL 2.79; WLHW 5.37; WLW 2.74; a/b 1.70; c/d 1.79; FP 1.16; FPHW 2.23; FPC 6.82; FSP 1.33.

Larva unknown.

Host-plant. Adults were collected on *Baccharis humifusa* H. B. K.

Calinda yungas sp. n. (Figs 15g, 19p, 22l, 43b)

Holotype ♂, Ecuador: Napo, Papallacta, 4100 m, 24.ii.1983 (L. Huggert), slide mounted (MZLU).

Distribution. Ecuador (Napo).

Description. Adult. Male. Head brownish yellow, pronotum ochreous with black stripes laterally, mesopraescutum dark brown with posterior half of median portion yellow, mesoscutum and mesoscutellum ochreous. Antennal segments 1-2 brownish ochreous, 3-10 dark brown. Abdomen ochreous, apices of paramere and proctiger dark brown. Legs ochreous with brown patches. Forewing transparent with brown veins.

Forewing rounded apically; vein Rs in the middle shallowly and evenly curved toward foremargin; costal setae as long as distance between them. Surface spinules absent apart from base of cell cu_2; radular spinules forming well-defined, wide triangles. Mesonotum with long setae. Male proctiger, in profile, thick, tubular, without apical process, hindmargin almost straight. Paramere as long as proctiger, wide, truncate apically with two apical sclerotised teeth, medial constriction weak;

entire inner surface covered in setae. Apical dilatation of distal segment of aedeagus elongate with ventro-basal hook which is close to shaft.

Measurements: ♂ (1): HW 0.59; AL 2.05; ALHW 3.47; L3/L4 1.27; LLHW 1.00; TLHW1.53; WL 3.48; WLHW 5.90; WLW 2.30; a/b 1.27; c/d 1.59; MP 0.37; MPHW 0.63; PL 0.38; AEL 0.43.

Female, larva and host-plant unknown.

NON IDENTIFIED MATERIAL

The following specimens could not be identified due to insufficient material. They are grouped according to country of provenience. This material suggests that many additional species are to be expected and that more field work should be done.

Argentina

Calinda sp. 1

1 ♂, Jujuy, Rt 9, Volcán, 5.ii.1990, *Baccharis salicifolia* (P. E. Boldt), dry mounted (MHNG).

Comments. The single ♂ at hand resembles *C. peruana.*

Chile

Calinda sp.

Comments. Rübsaamen (1899) reported a psylloid gall on *Senecio falklandicus* (a likely misidentification) from Chile: Punta Arenas, and described the larva. The species resembles closely *C. patagonica*, but differs in the longer setosity and larger legs.

Colombia

Calinda sp. 1

1 ♂, 1 ♀, iii.1911, dry and slide mounted (USNM).

Calinda sp. 2

2 ♀, Boyaca, Sogamoso, 29.v.1946 (E. A. Chapin), Sta 26-23, dry mounted (USNM).

Ecuador

Calinda sp. 1

1 ♂, Napo, Papallacta, 24.ii.1983 (L. Huggert), dry mounted (MZLU).

Calinda sp. 1

3 ©, Chillacocha, 2900 m, ii.1905 (P. Rivet), dry mounted (MNHN).

Comments. Listed as *T. testacea* Form a by Burckhardt (1988).

Peru

Calinda sp. 1

1 ♀, near Ambo, 27.xii.1958 (L. D. Tuthill), slide mounted (USNM).

U.S.A.

Calinda sp. 1

2 larvae, Arizona, Cochise County, Huachuca Mts, Coronado National Memorial, 14.vii.1988, *Baccharis bigelovii* (T. O. Robbins), slide mounted (MHNG).

Comments. The two specimens at hand are fourth instar larvae. They differ from fifth instar larvae of *C. longistylus* in the slightly larger circumanal ring. Additional material is necessary to decide whether this is a different species.

VENEZUELA

Calinda sp. 1

1 ♀, Mérida, Mucuchíes, 31.viiii.1979, *Pisum sativa* (M. Cermeli), dry mounted (IZAV).

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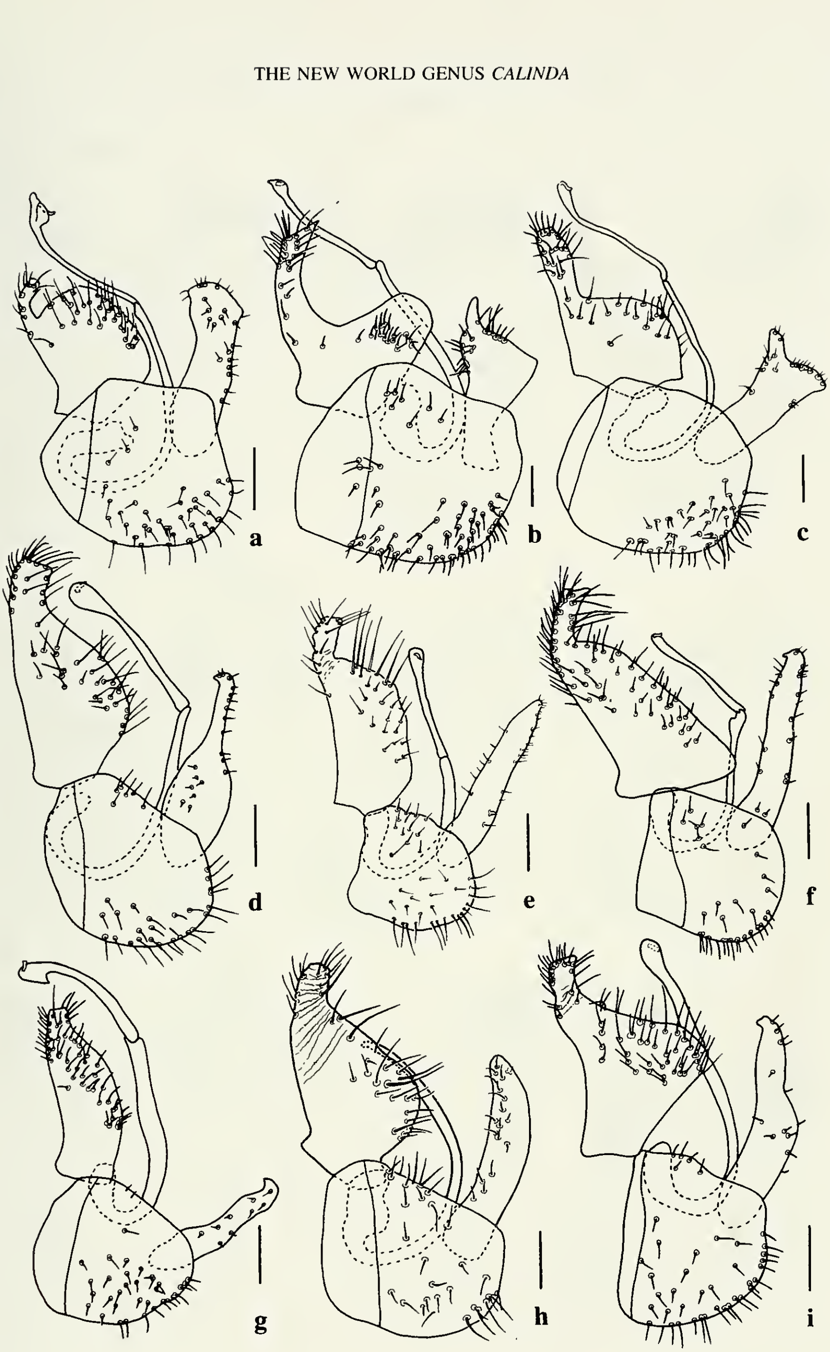

FIG. 13

Calinda spp., male genitalia, in profile. a: *C. broomfieldi* sp. n.; b: *C. magniforceps* (Tuthill); c: *C. peruana* (Tuthill); d: *C. osorii* sp. n.; e: *C. salicifoliae* sp. n.; f: *C. baccharidis* (Tuthill); g: *C. velardei* (Tuthill); h: *C. proximata* (Crawford); i: *C. tuthilli* sp. n.; scale lines = 0.1 mm.

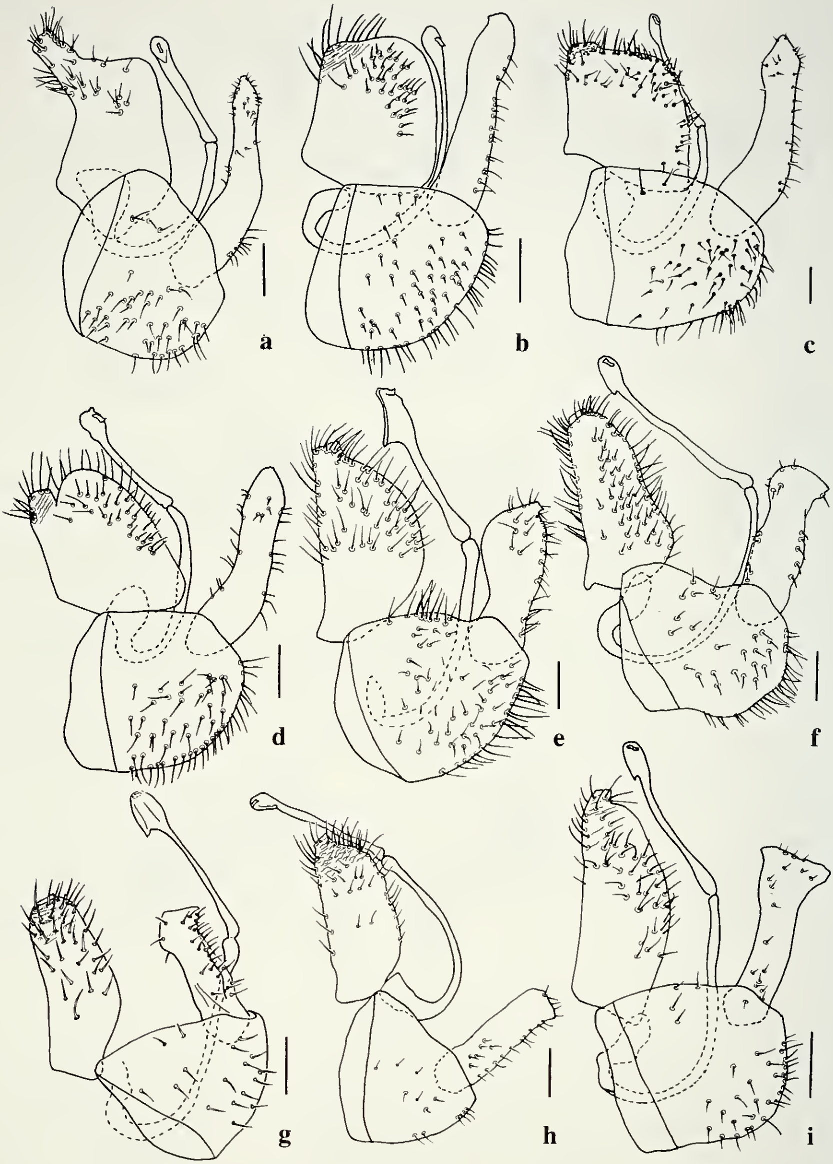

FIG. 14

Calinda spp., male genitalia, in profile. a: *C. jibara* sp. n.; b: *C. albonigra* sp. n.: c: *C. penai* sp. n.; d: *C. gibbosa* (Tuthill); e: *C. spatulata* sp. n.; f: *C. huggerti* sp. n.; g, h: *C. peterseni* sp. n.; i: *C. aguilari* (Tuthill); scale lines = 0.1 mm.

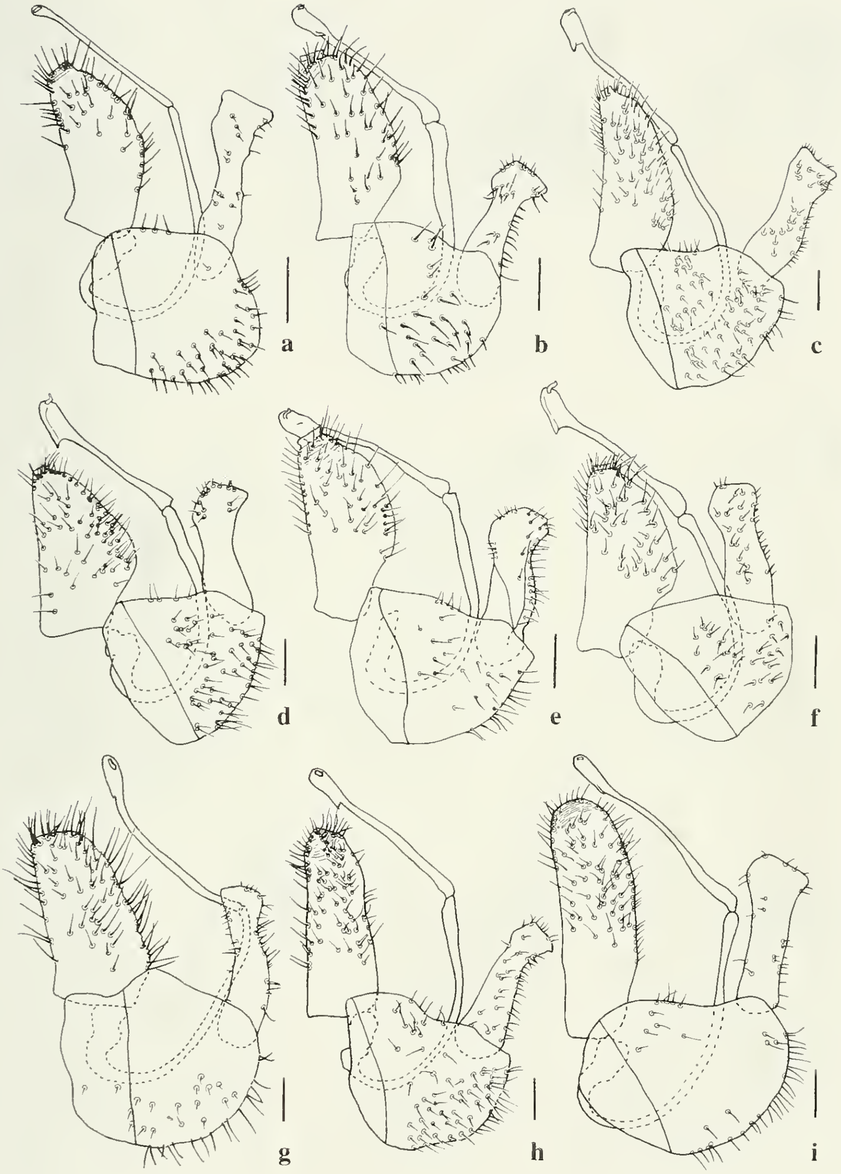

FIG. 15

Calinda spp., male genitalia, in profile. a: *C. inca* sp. n.; b: *C. parviceps* (Tuthill); c: *C. hodkinsoni* sp. n.; d: *C. chionophili* sp. n.; e: *C. patagonica* sp. n.; f: *C. reversyi* sp. n.; g: *C. yungas* sp. n.; h: *C. microcephala* sp. n.; i: *C. otavalo* sp. n.; scale lines = 0.1 mm.

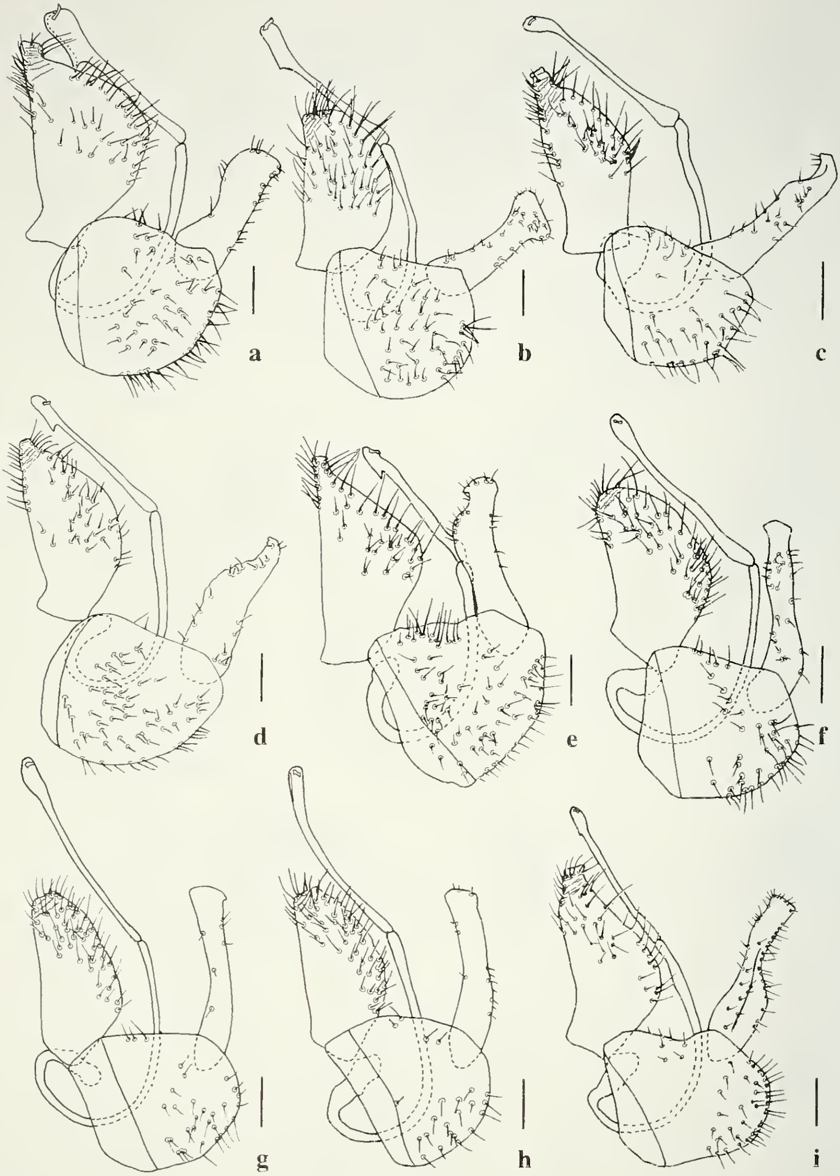

FIG. 16

Calinda spp., male genitalia, in profile. a: *C. brevicauda* sp. n.; b: *C. panamensis* (Brown & Hodkinson); c: *C. trinervis* sp. n.; d: *C. longicollis* sp. n.; e: *C. falciforceps* sp. n.; f: *C. araucana* sp. n.; g: *C. ambigua* sp. n.; h: *C. boldti* sp. n.; i: *C. pehuenche* sp. n.; scale lines = 0.1 mm.

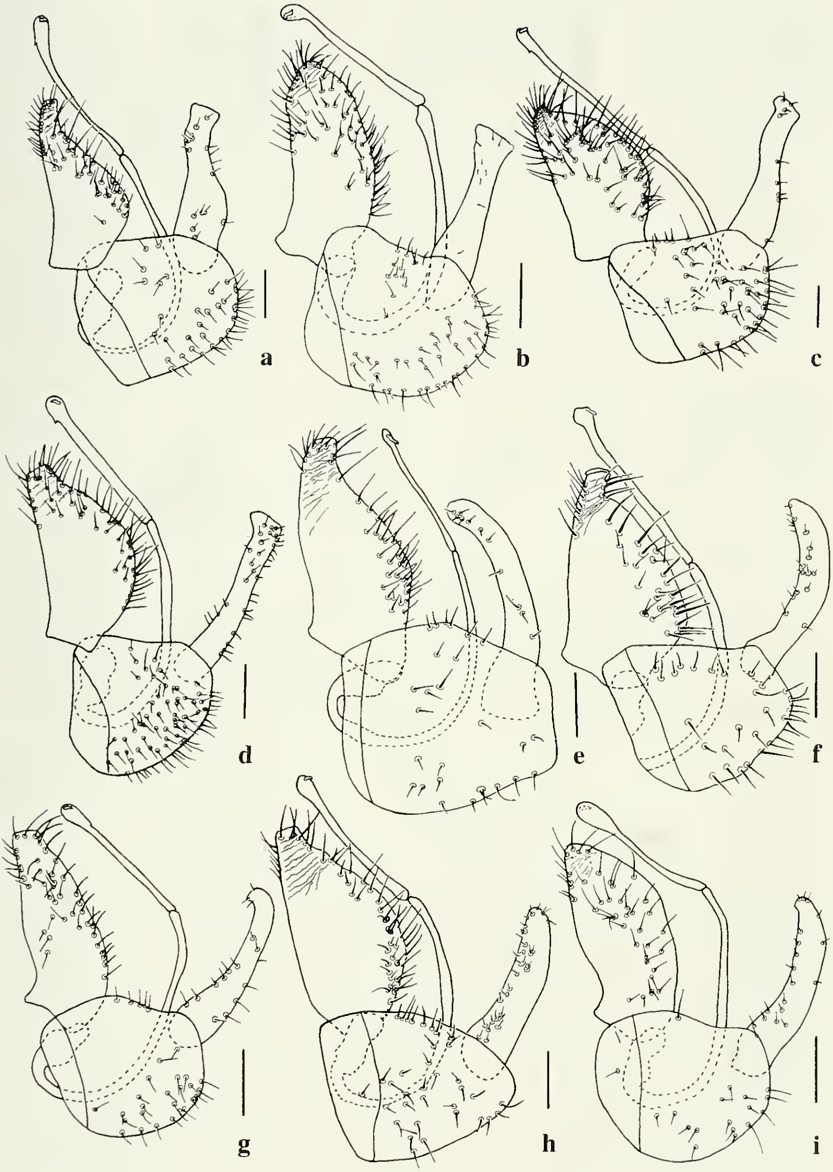

FIG. 17

Calinda spp., male genitalia, in profile. a: *C. mendocina* (Kieffer & Jörgensen); b: *C. hollisi* sp. n.; c: *C. antucana* sp. n.; d: *C. testacea* Blanchard; e: *C. graciliforceps* sp. n.; f: *C. longicaudata* sp. n.; g: *C. plaumanni* sp. n.; h: *C. collaris* (Crawford); i: *C. branisai* sp. n.; scale lines = 0.1 mm.

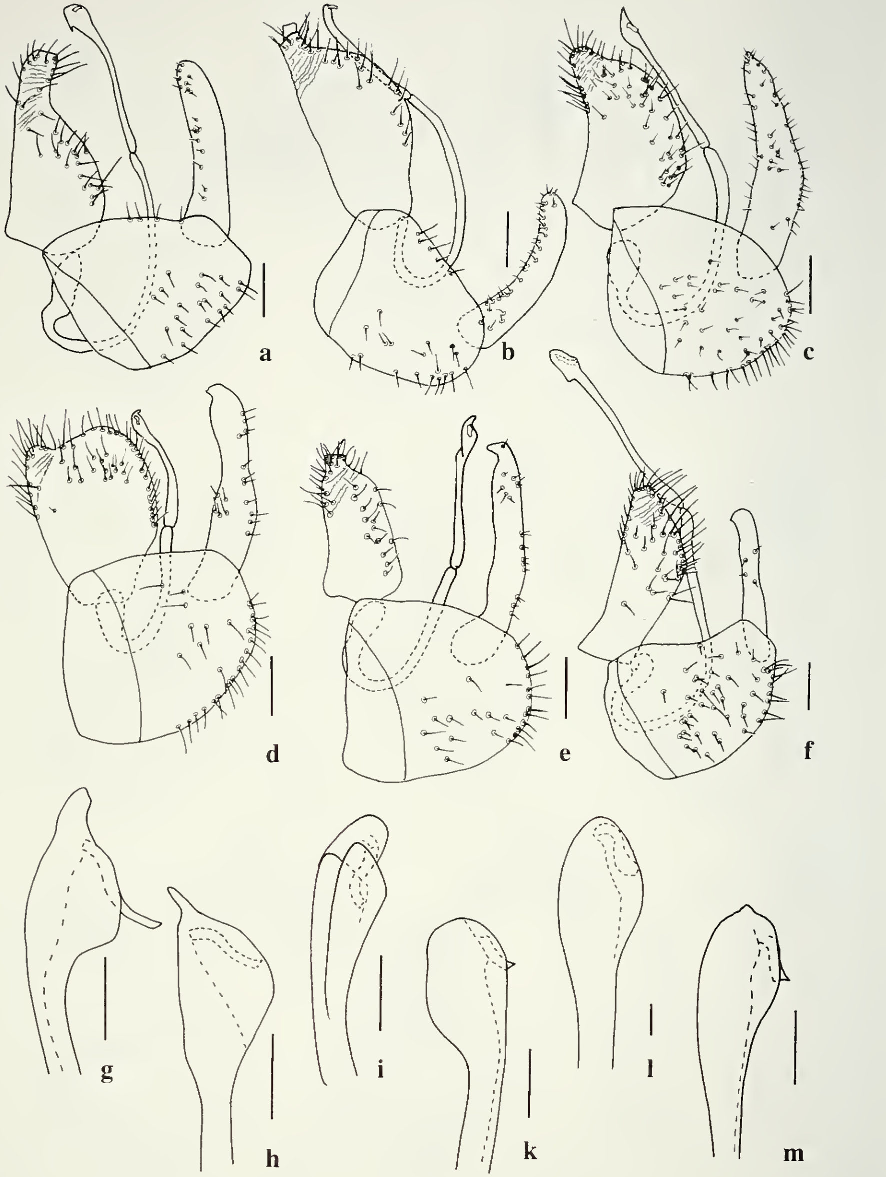

FIG. 18

Calinda spp. a-f: male genitalia, in profile, scale lines = 0.1 mm; g-m: apical dilatation of distal segment of aedeagus, scale lines = 0.03 mm. a: *C. longistylus* (Crawford); b: *C. fumipennis* sp. n.; c: *C. gladiformis* sp. n.; d: *C. simoni* (Tuthill); e: *C. beingoleai* (Tuthill); f: *C. muiscas* sp. n.; g: *C. broomfieldi* sp. n.; h: *C. magniforceps* (Tuthill); i: *C. peruana* (Tuthill); k: *C. osorii* sp. n.; l: *C. salicifoliae* sp. n.; m: *C. baccharidis* (Tuthill).

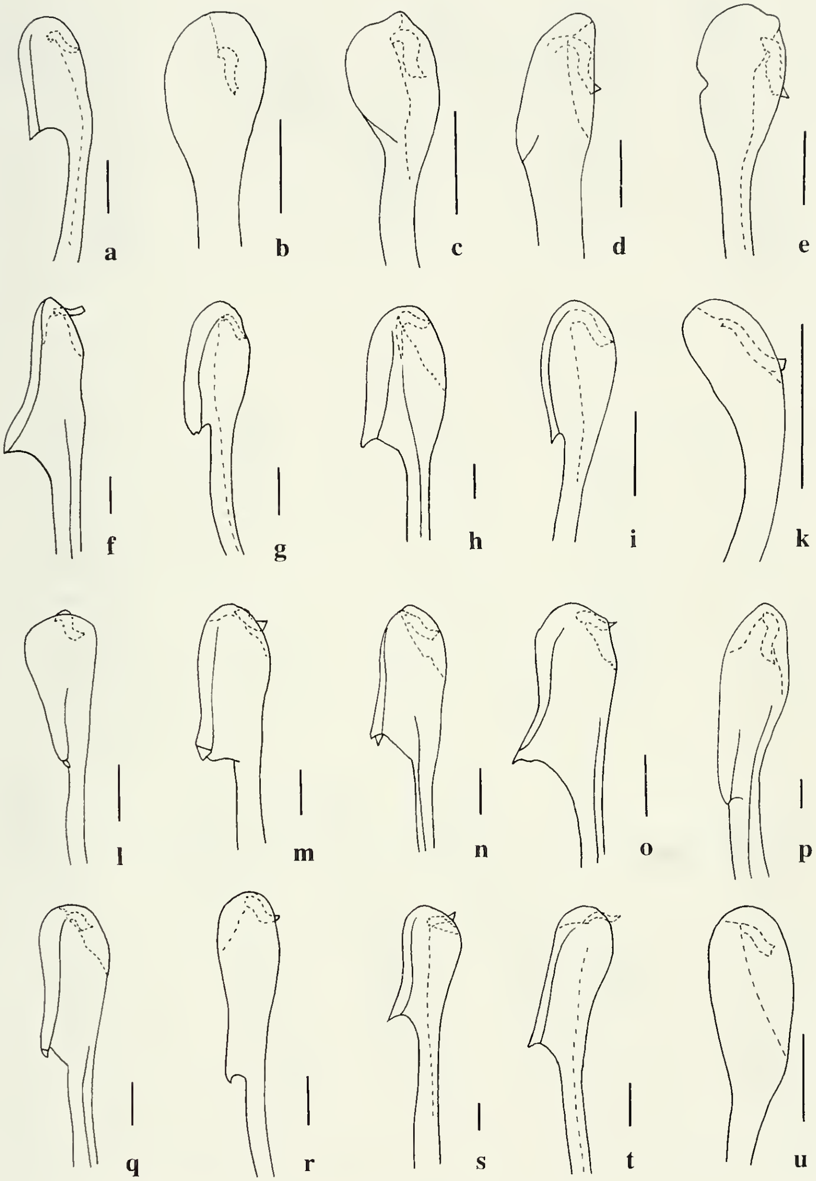

FIG. 19

Calinda spp., apical dilatation of distal segment of aedeagus. a: *C. velardei* (Tuthill); b: *C. tuthilli* sp. n.; c: *C. albonigra* sp. n.; d: *C. penai* sp. n.; e: *C. gibbosa* (Tuthill); f: *C. spatulata* sp. n.; g: *C. huggerti* sp. n.; h: *C. peterseni* sp. n.; i: *C. aguilari* (Tuthill); k: *C. inca* sp. n.; l: *C. parviceps* (Tuthill); m: *C. hodkinsoni* sp. n., n: *C. chionophili* sp. n.; o: *C. patagonica* sp. n.; p: *C. yungas* sp. n.; q: *C. microcephala* sp. n.; r: *C. otavalo* sp. n.; s: *C. brevicauda* sp. n.; t: *C. panamensis* (Brown & Hodkinson); u: *C. trinervis* sp. n.; scale lines = 0.03 mm.

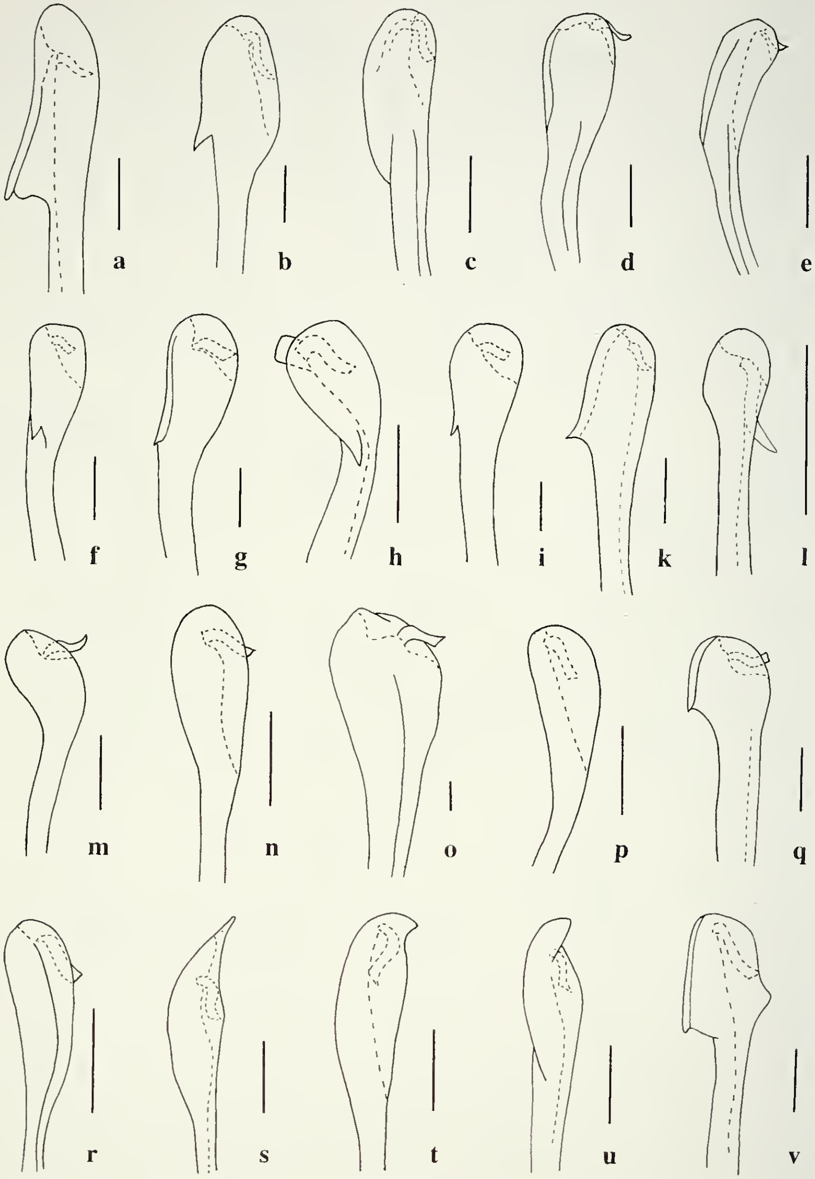

FIG. 20

Calinda spp., apical dilatation of distal segment of aedeagus. a: *C. longicollis* sp. n.; b: *C. falciforceps* sp. n.; c: *C. araucana* sp. n.; d: *C. ambigua* sp. n.; e: *boldti* sp. n.; f: *C. pehuenche* sp. n.; g: *C. mendocina* (Kieffer & Jörgensen); h: *C. hollisi* sp. n.; i: *C. antucana* sp. n.; k: *C. testacea* Blanchard; l: *C. graciliforceps* sp. n.; m: *C. longicaudata* sp. n., n: *C. plaumanni* sp. n.; o: *C. collaris* (Crawford); p: *C. branisai* sp. n.; q: *C. longistylus* (Crawford); r: *C. fumipennis* sp. n.; s: *C. gladiformis* sp. n.; t: *C. simoni* (Tuthill); u: *C. beingoleai* (Tuthill); *C. muiscas* sp. n.; scale lines = 0.03 mm.

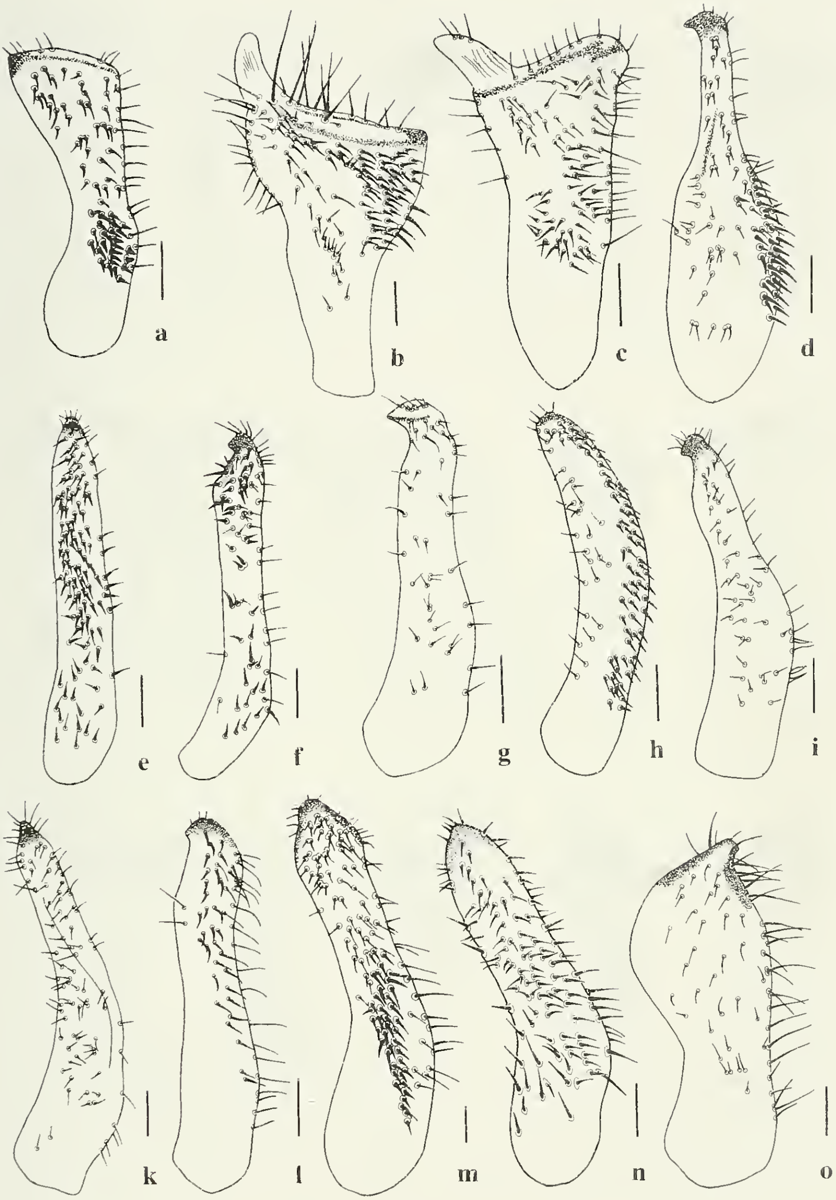

FIG. 21

Calinda spp., paramere, inner face. a: *C. broomfieldi* sp. n.; b: *C. magniforceps* (Tuthill); c: *C. peruana* (Tuthill); d: *C. osorii* sp. n.; e: *C. salicifoliae* sp. n.; f: *C. baccharidis* (Tuthill); g: *C. velardei* (Tuthill); h: *C. proximata* (Crawford); i: *C. tuthilli* sp. n.; k: *C. jibara* sp. n.; l: *C. albonigra* sp. n.; m: *C. penai* sp. n.; n: *C. gibbosa* (Tuthill); o: *C. spatulata* sp. n.; scale lines = 0.05 mm.

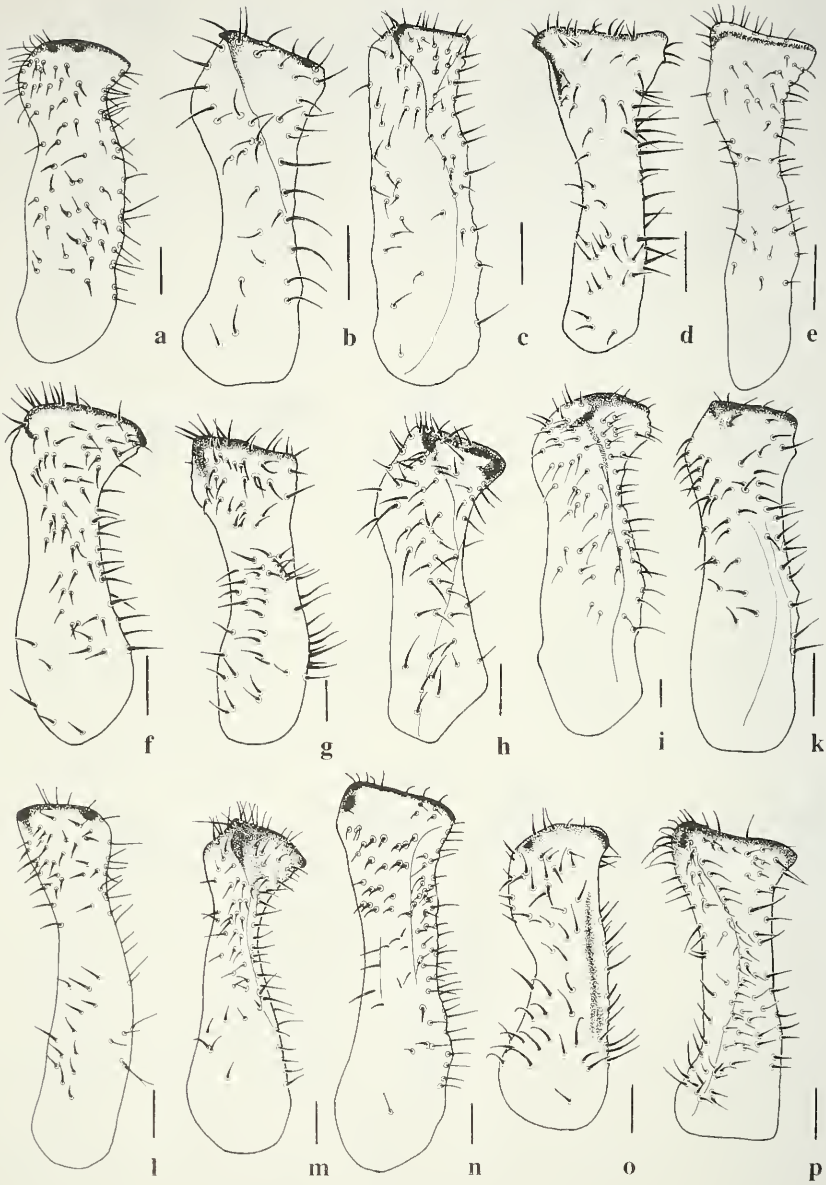

FIG. 22

Calinda spp., paramere, inner face. a: *C. huggerti* sp. n.; b, c: *C. peterseni* sp. n.; d: *C. aguilari* (Tuthill); e: *C. inca* sp. n.; f: *C. parviceps* (Tuthill); g: *C. hodkinsoni* sp. n.; h: *C. chionophili* sp. n.; i: *C. patagonica* sp. n.; k: *C. reversyi* sp. n.; l: *C. yungas* sp. n.; m: *C. microcephala* sp. n., n: *C. otavalo* sp. n.; o: *C. brevicauda* sp. n.; p: *C. panamensis* (Brown & Hodkinson); scale lines = 0.05 mm.

FIG. 23

Calinda spp., paramere, inner face. a: *C. trinervis* sp. n.; b: *C. longicollis* sp. n.; c: *C. falciforceps* sp. n.; d, e: *C. araucana* sp. n.; f-i: *C. ambigua* sp. n.; k, l: *C. boldti* sp. n.; m: *C. pehuenche* sp. n., n: *C. mendocina* (Kieffer & Jörgensen); o: *C. hollisi* sp. n.; p: *C. antucana* sp. n.; q: *C. testacea* Blanchard; scale lines = 0.05 mm.

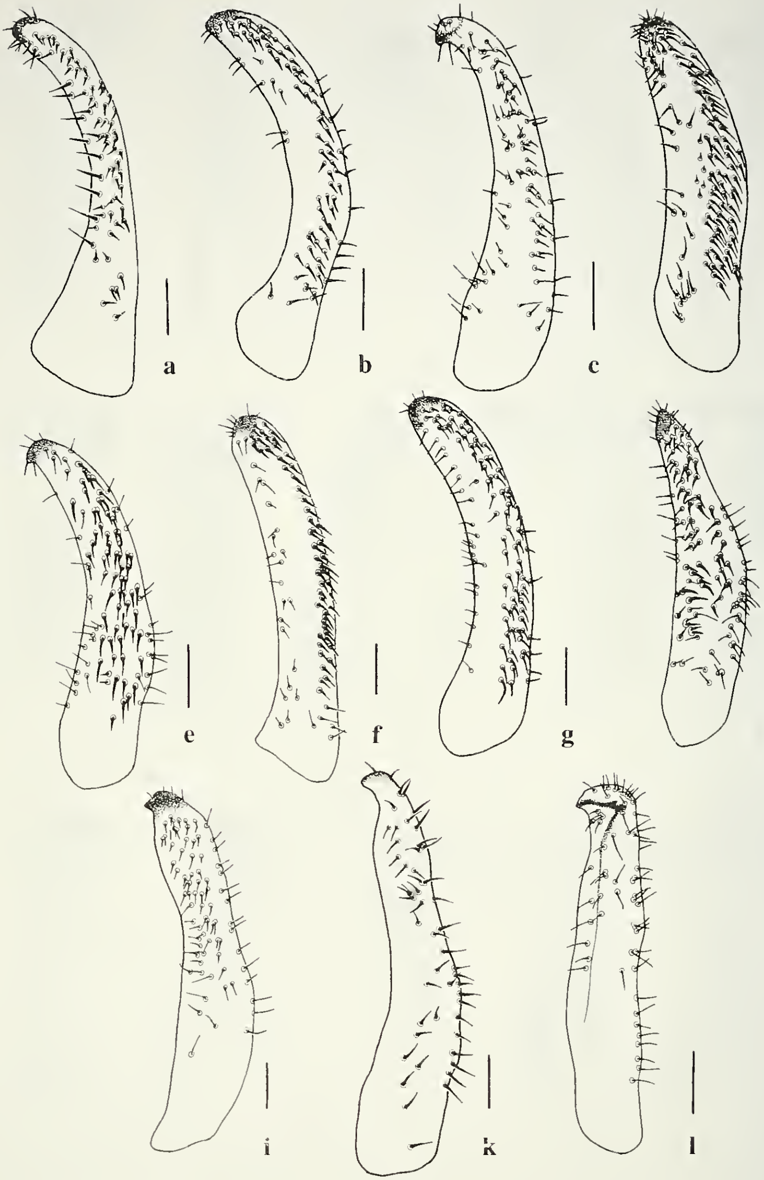

FIG. 24

Calinda spp., paramere, inner face. a: *C. graciliforceps* sp. n.; b: *C. longicaudata* sp. n.; c: *C. plaumanni* sp. n.; d: *C. collaris* (Crawford); e: *C. branisai* sp. n.; f: *C. longistylus* (Crawford); g: *C. fumipennis* sp. n.; h: *C. gladiformis* sp. n.; i: *C. simoni* (Tuthill); k: *C. beingoleai* (Tuthill); l: *C. muiscas* sp. n.; scale lines = 0.05 mm.

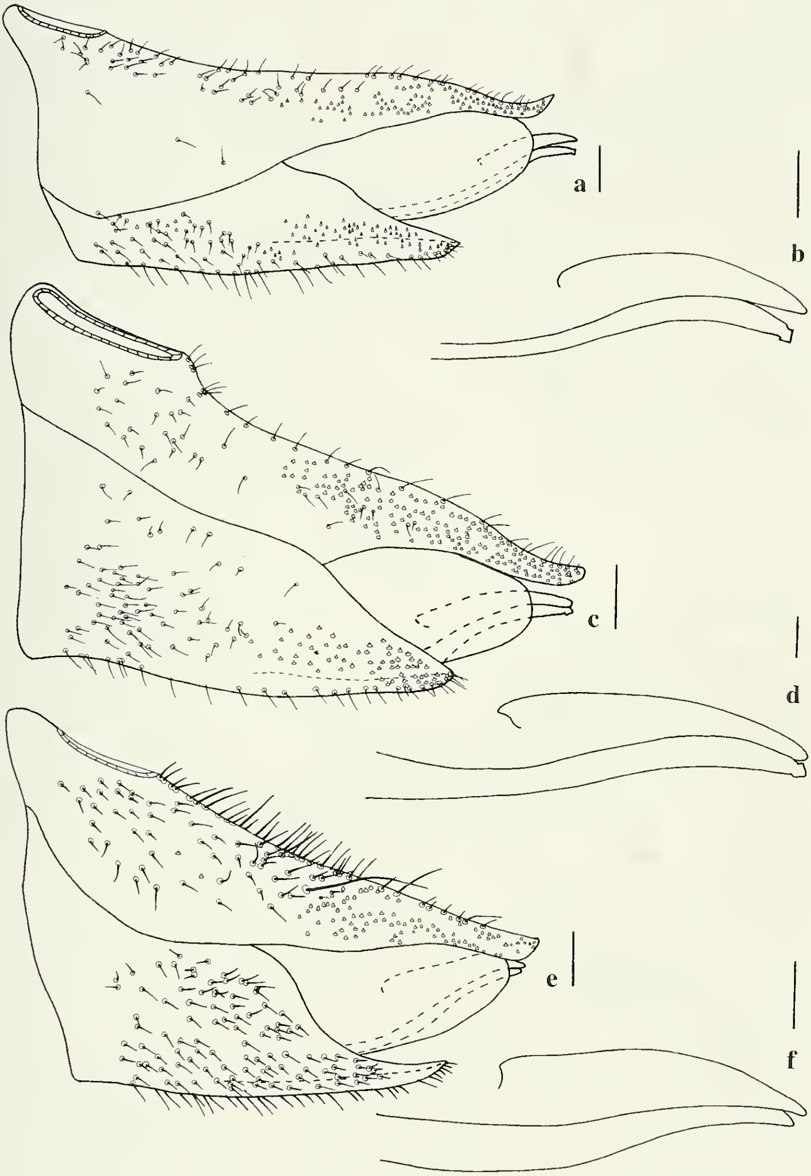

FIG. 25

Calinda spp. a, c, e: female genitalia, in profile, scale lines = 0.1 mm; b, d, f: valvulae dorsalis and ventralis; scale lines = 0.05 mm. a, b: *C. velardei* (Tuthill); c, d: *C. trinervis* sp. n.; e, f: *C. longicollis* sp. n.

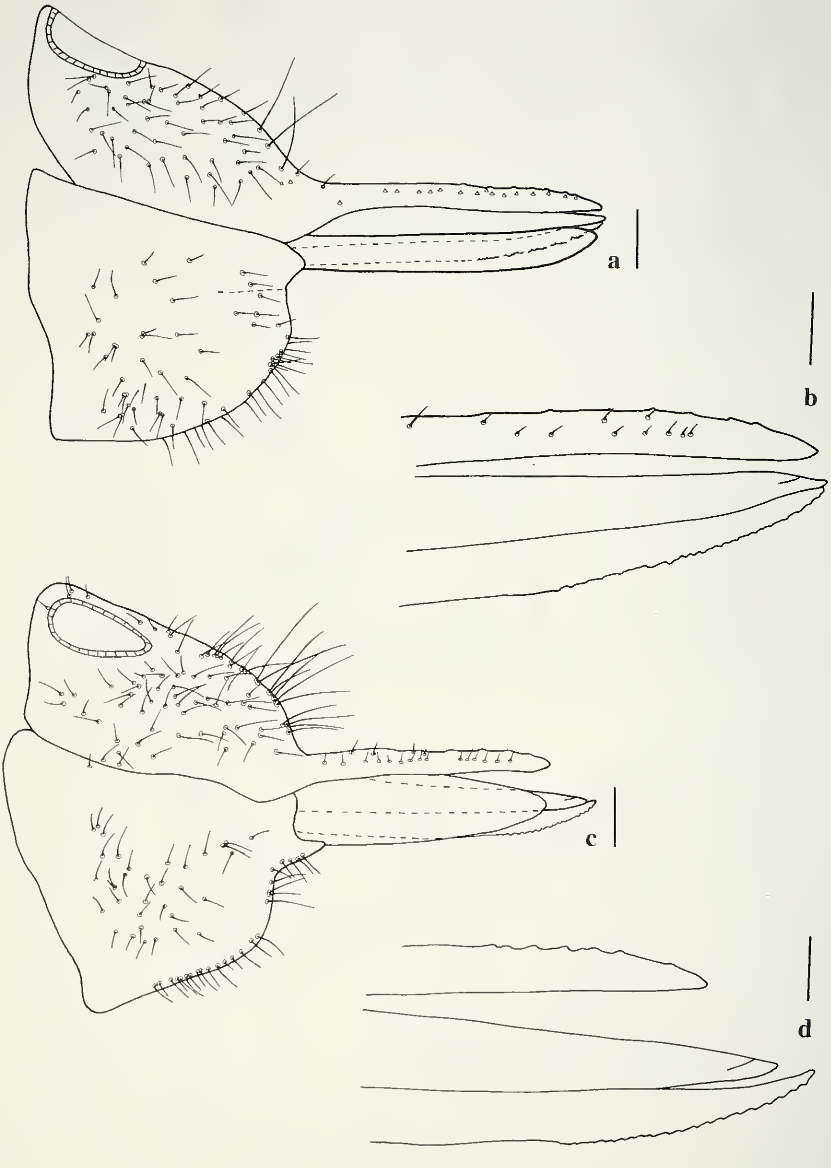

FIG. 26

Calinda spp. a, c: female genitalia, in profile; scale lines = 0.1 mm; b, d: valvulae dorsalis and ventralis, scale lines = 0.05 mm. a, b: *C. magniforceps* (Tuthill); c, d: *C. peruana* (Tuthill).

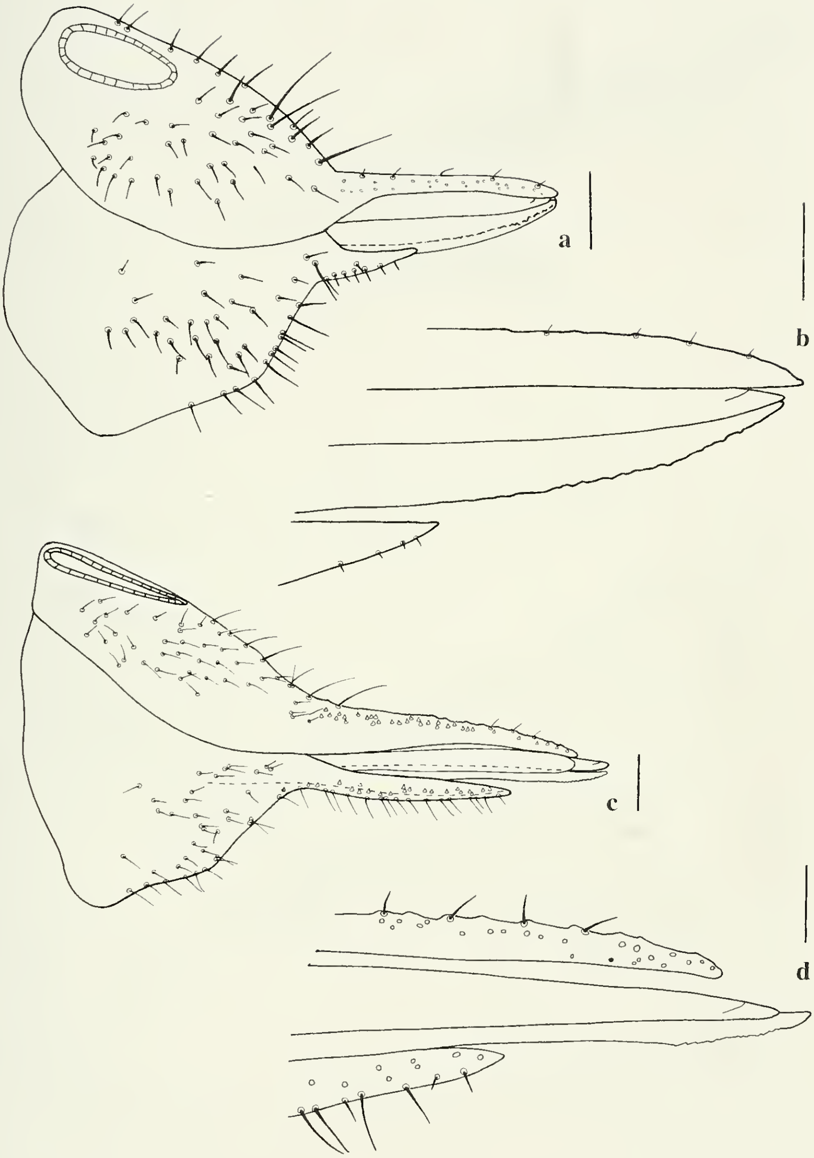

FIG. 27

Calinda spp. a, c: female genitalia, in profile; scale lines = 0.1 mm; b, d: valvulae dorsalis and ventralis, scale lines = 0.05 mm. a, b: *C. broomfieldi* sp. n.; c, d: *C. luggerti* sp. n.

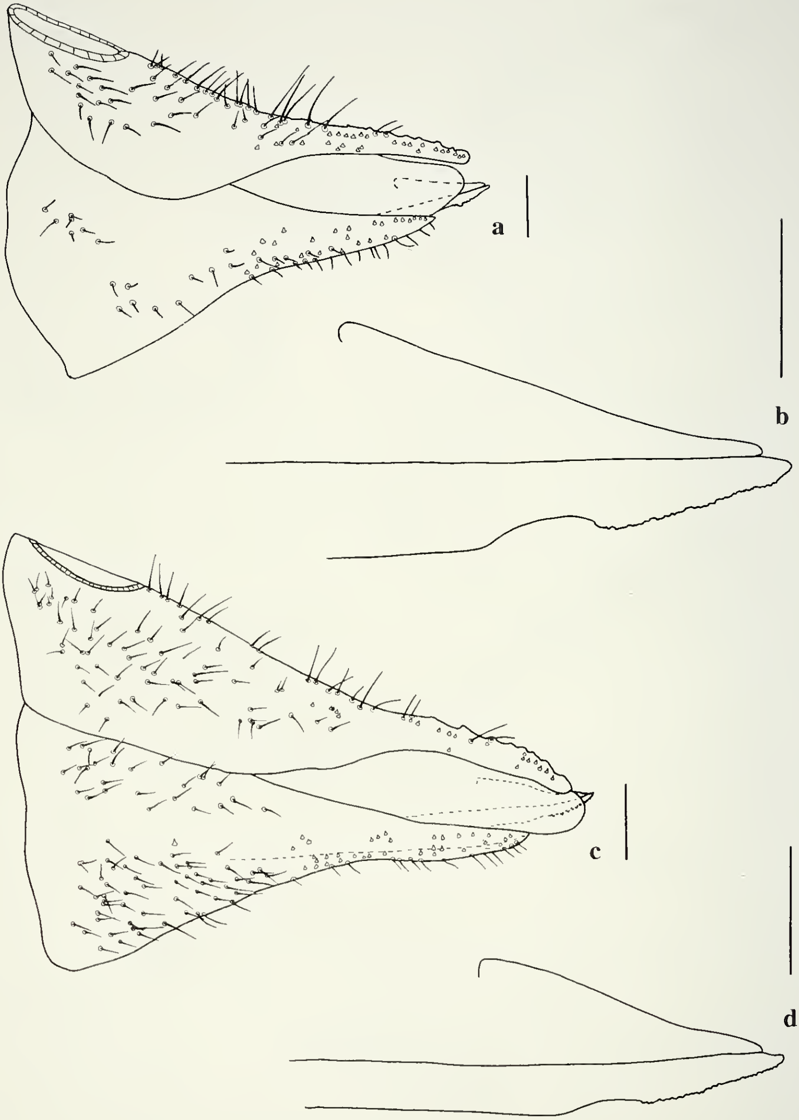

FIG. 28

Calinda spp. a, c: female genitalia, in profile, scale lines = 0.1 mm; b, d: valvulae dorsalis and ventralis, scale lines = 0.05 mm. a, b: *C. peterseni* sp. n.; c, d: *C. patagonica* sp. n.

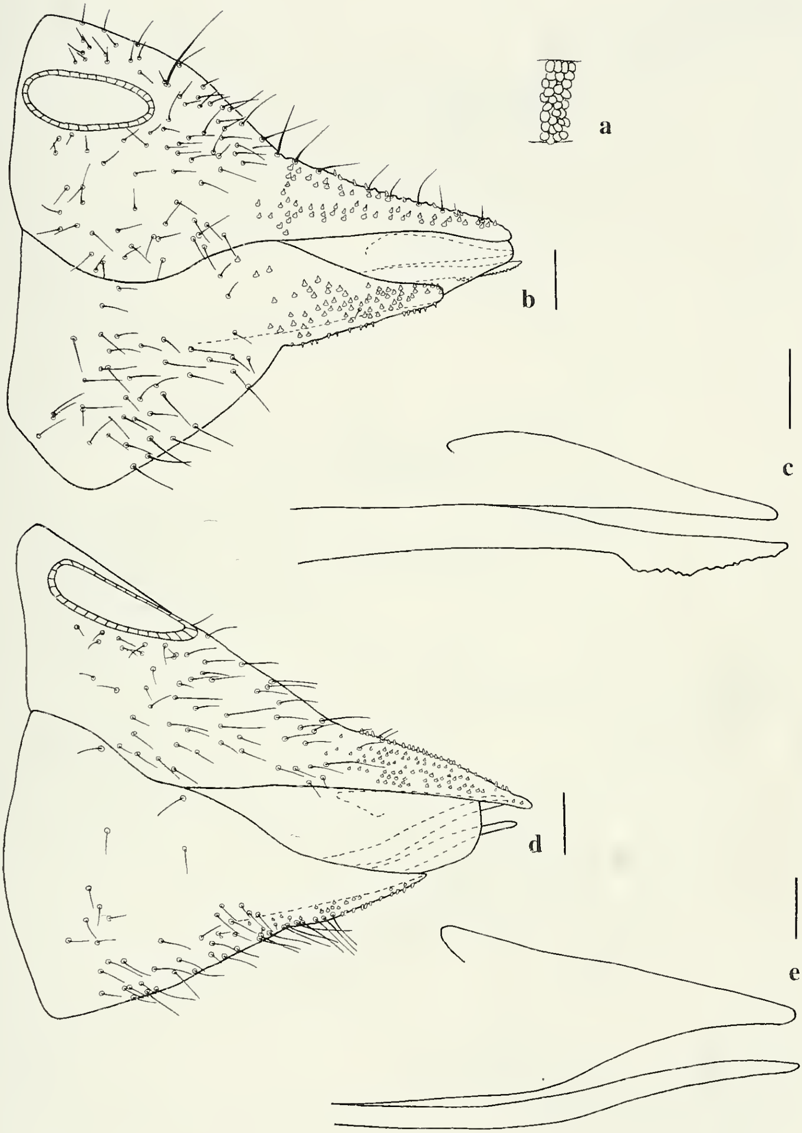

FIG. 29

Calinda spp. a: section of female circumanal ring; b, d: female genitalia, in profile, scale lines = 0.1 mm; c, e: valvulae dorsalis and ventralis, scale lines = 0.05 mm. a-c: *C. chionophili* sp. n.; d, e: *C. brevicauda* sp. n.

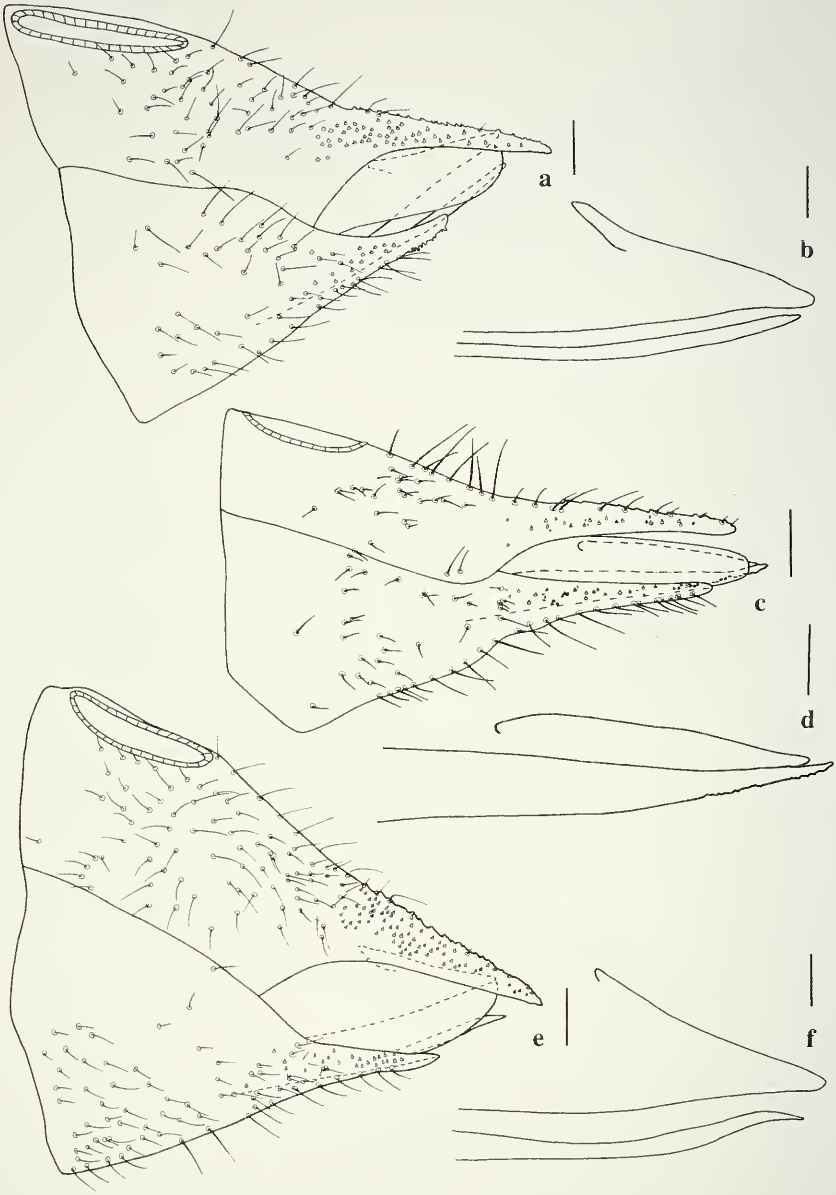

FIG. 30

Calinda spp., a, c, e: female genitalia, in profile. Scale lines = 0.1 mm, b, d, f: valvulae dorsalis and ventralis Scale lines = 0.05 mm. a, b: *C. falciforceps* sp. n.; c, d: *C. panamensis* (Brown & Hodkinson); e, f: *C. spatulata* sp. n.

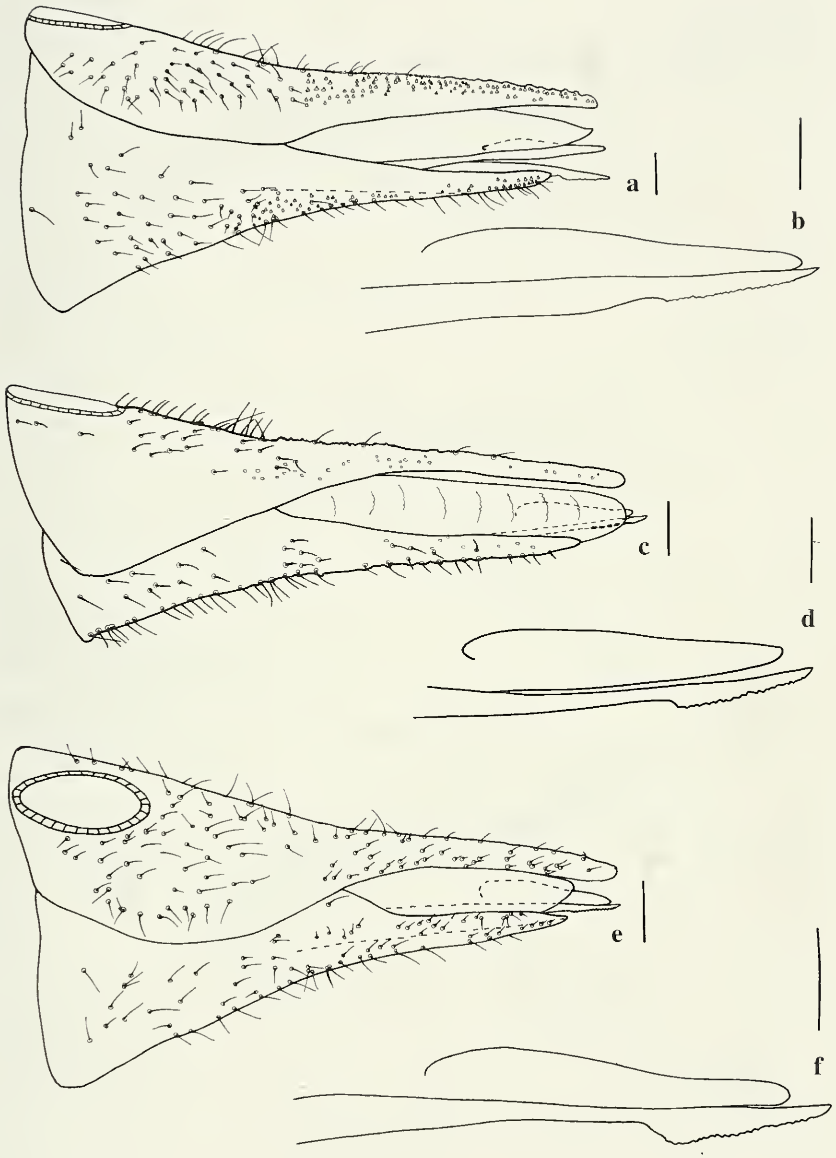

FIG. 31

Calinda spp. a, c, e: female genitalia, in profile, scale lines = 0.1 mm; b, d, f: valvulae dorsalis and ventralis, scale lines = 0.05 mm. a, b: *C. otavalo* sp. n.; c, d: *C. microcephala* sp. n.; e, f: *C. parviceps* (Tuthill).

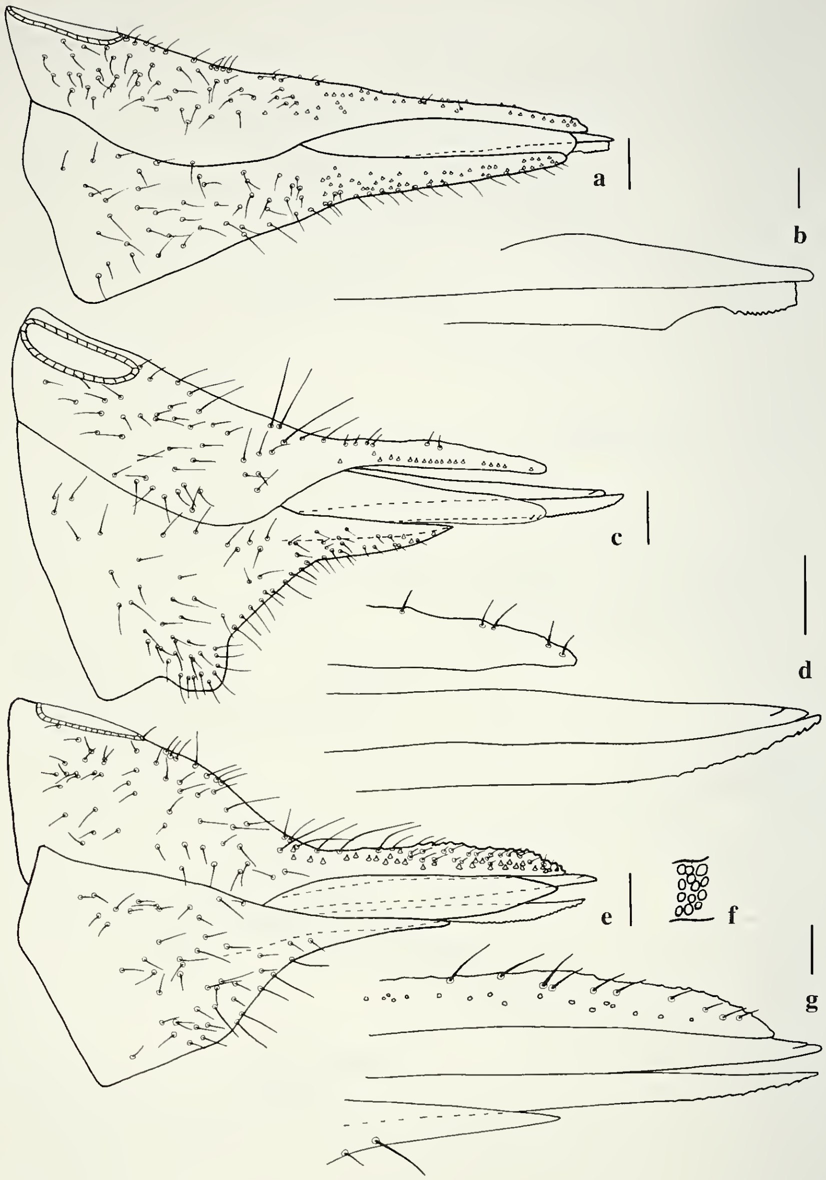

FIG. 32

Calinda spp. a, c, e: female genitalia, in profile, scale lines = 0.1 mm; b, d, g: valvulae dorsalis and ventralis, scale lines = 0.05 mm; f: section of female circumanal ring. a, b: *C. hodkinsoni* sp. n.; c, d: *C. gibbosa* (Tuthill); e-g: *C. antucana* sp. n.

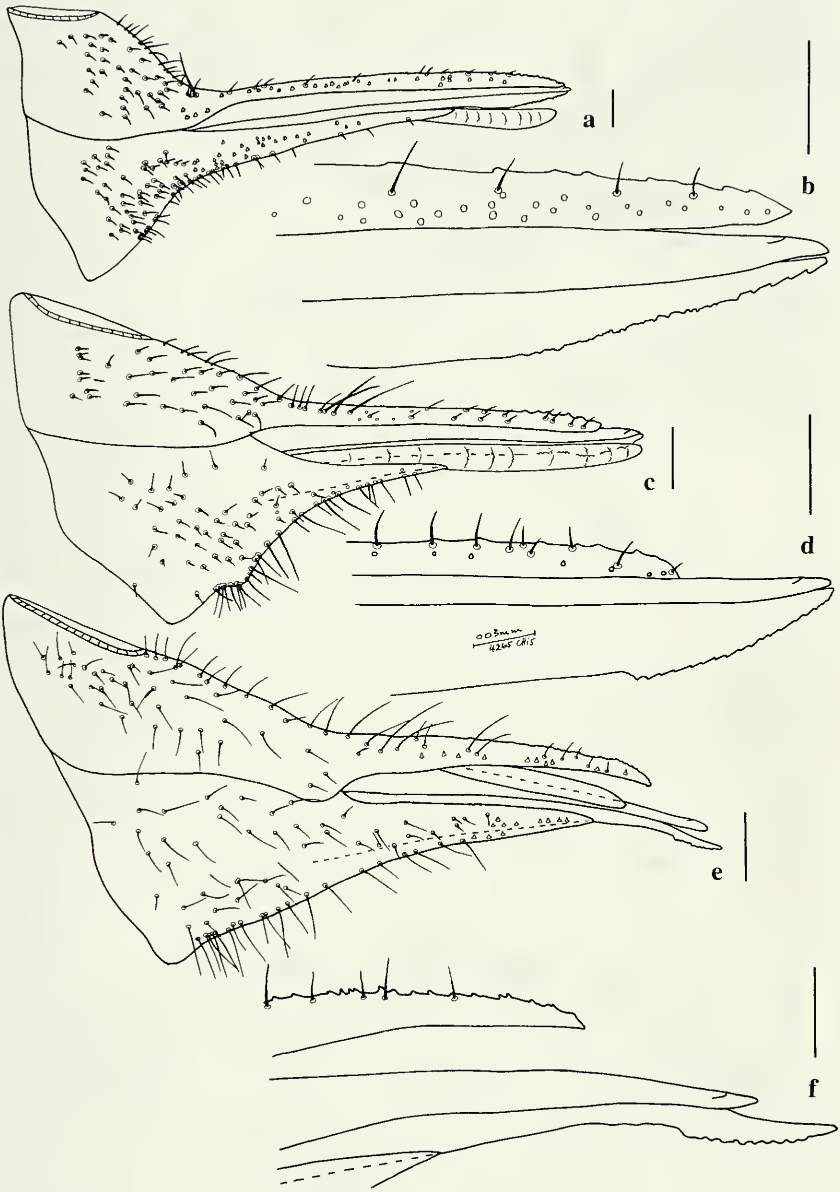

FIG. 33

Calinda spp. a, c, e: female genitalia, in profile, scale lines = 0.1 mm; b, d, f: valvulae dorsalis and ventralis, scale lines = 0.05 mm. a, b: *C. gladiformis* sp. n.; c, d: *C. araucana* sp. n; e, f: *C. baccharidis* (Tuthill).

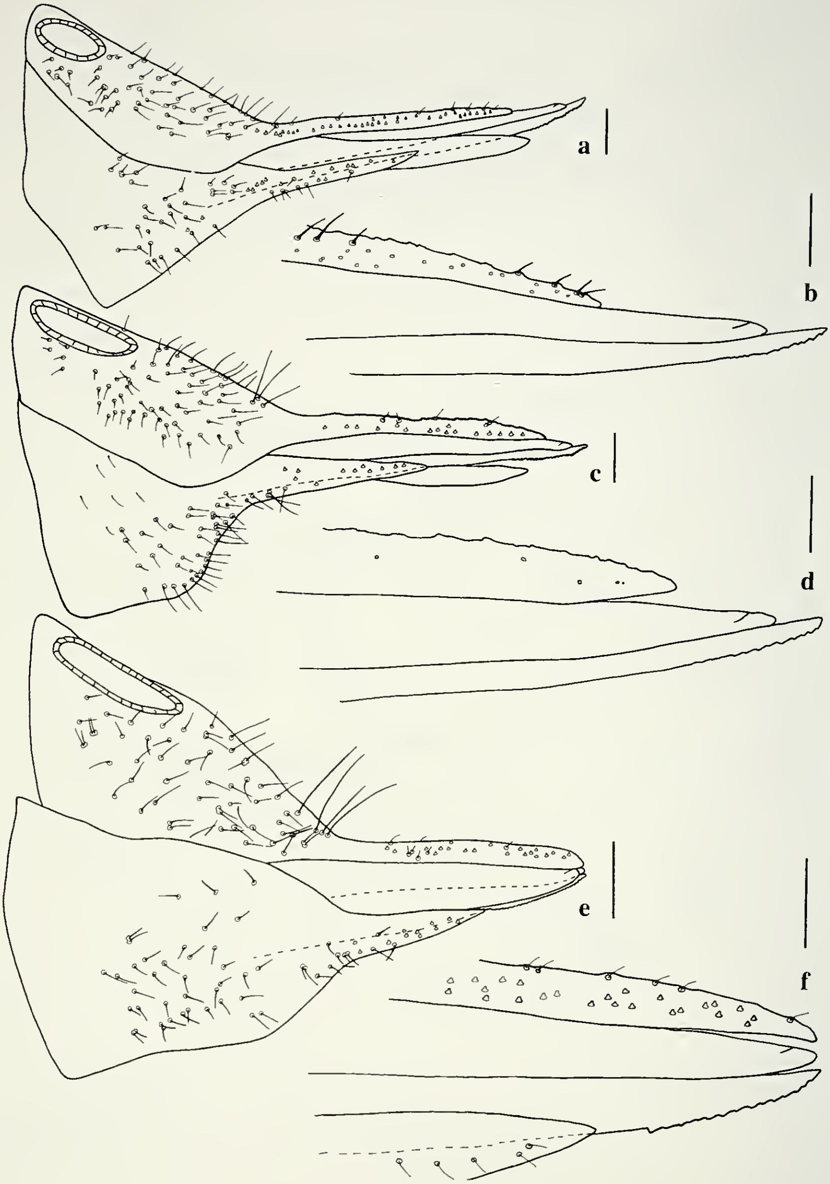

FIG. 34

Calinda spp. a, c, e: female genitalia, in profile, scale lines = 0.1 mm; b, d, f: valvulae dorsalis and ventralis, scale lines = 0.05 mm. a, b: *C. beingoleai* (Tuthill); c, d: *C. albonigra* sp. n; e, f: *C. mendocina* (Kieffer & Jörgensen).

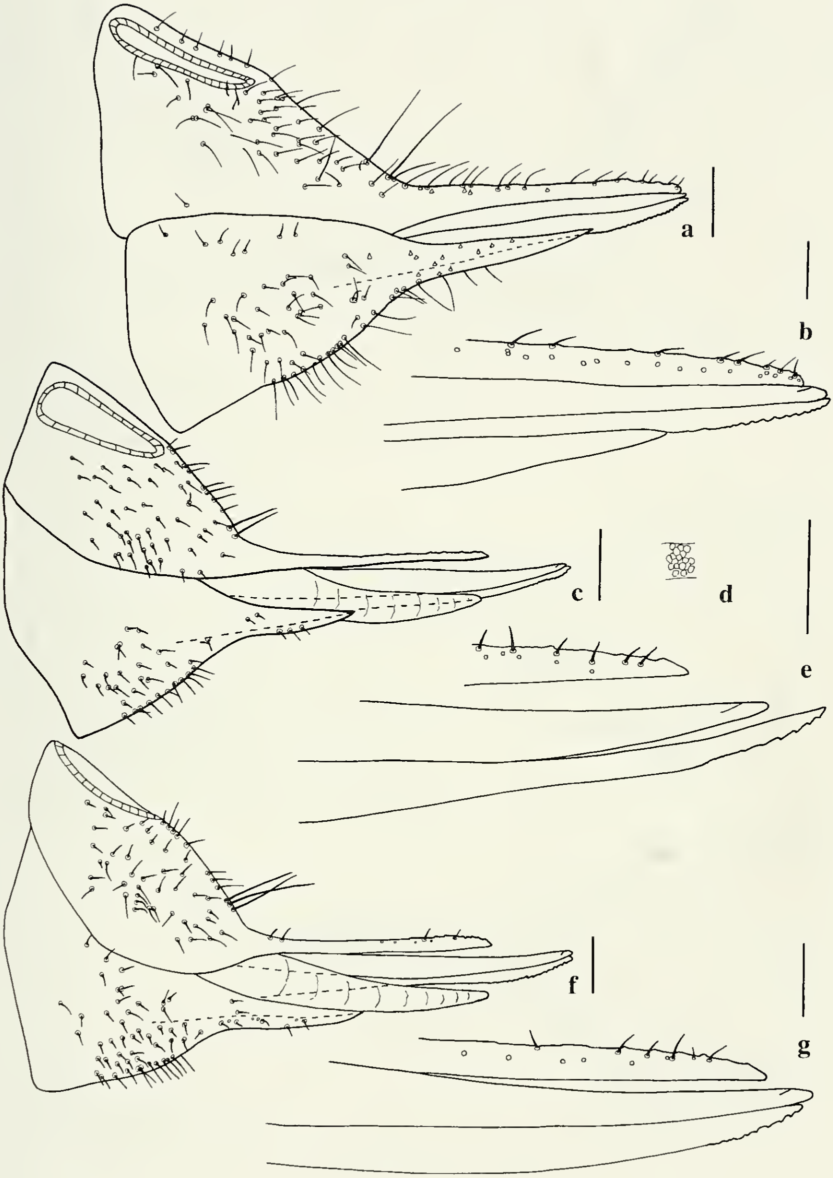

FIG. 35

Calinda spp. a, c, f: female genitalia, in profile, scale lines = 0.1 mm; b, e, g: valvulae dorsalis and ventralis, scale lines = 0.05 mm; d: section of female circumanal ring. a, b: *C. pehuenche* sp. n.; c-e: *C. boldti* sp. n.; f, g: *C. salicifoliae* sp. n.

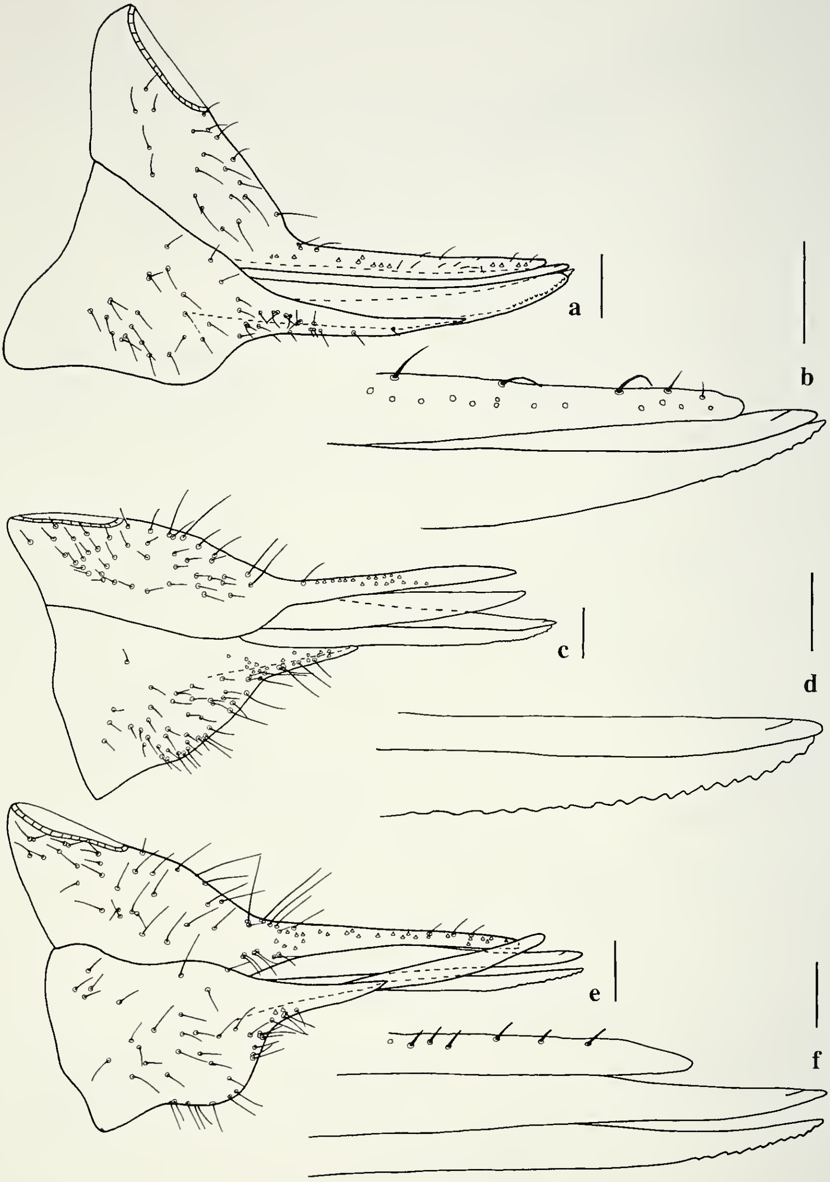

FIG. 36

Calinda spp. a, c, e: female genitalia, in profile, scale lines = 0.1 mm; b, d, f: valvulae dorsalis and ventralis, scale lines = 0.05 mm. a, b: *C. longistylus* (Crawford); c, d: *C. osorii* sp. n.; e, f: *C. inca* sp. n.

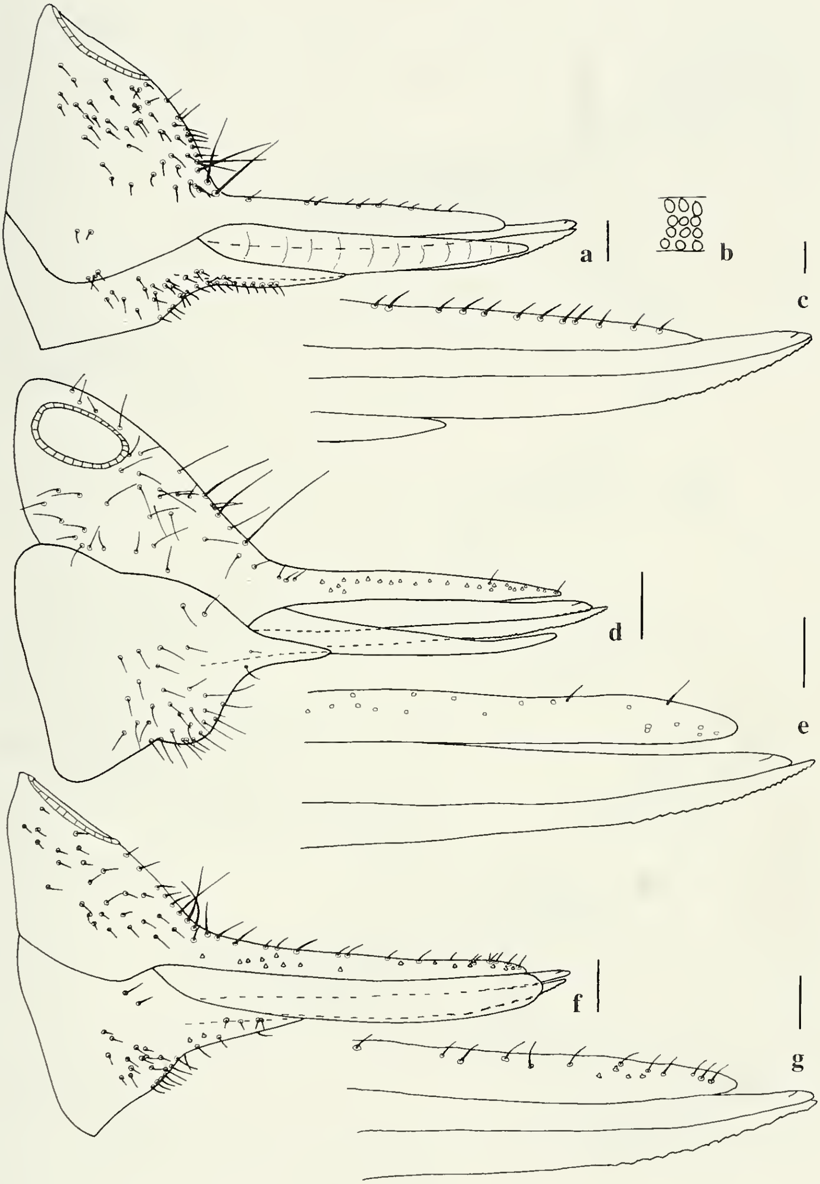

FIG. 37

Calinda spp. a, d, f: female genitalia, in profile, scale lines = 0.1 mm; c, e, g: valvulae dorsalis and ventralis, scale lines = 0.05 mm; b: section of female circumanal ring. a-c: *C. ambigua* sp. n.; d, e: *C. aguilari* (Tuthill); f, g: *C. testacea* Blanchard.

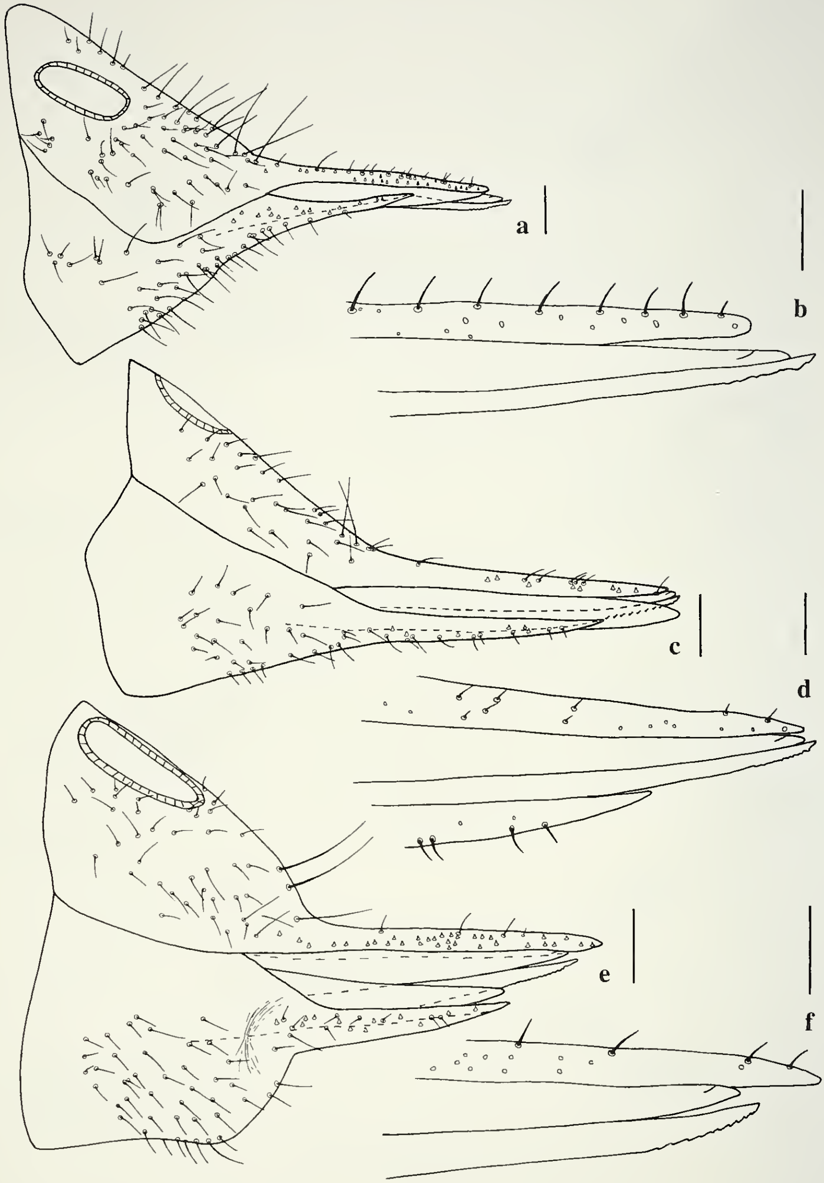

FIG. 38

Calinda spp. a, c, e: female genitalia, in profile, scale lines = 0.1 mm; b, d, f: valvulae dorsalis and ventralis, scale lines = 0.05 mm. a, b: *C. simoni* (Tuthill); c, d: *C. longicaudata* sp. n.; e, f: *C. fumipennis* sp. n.

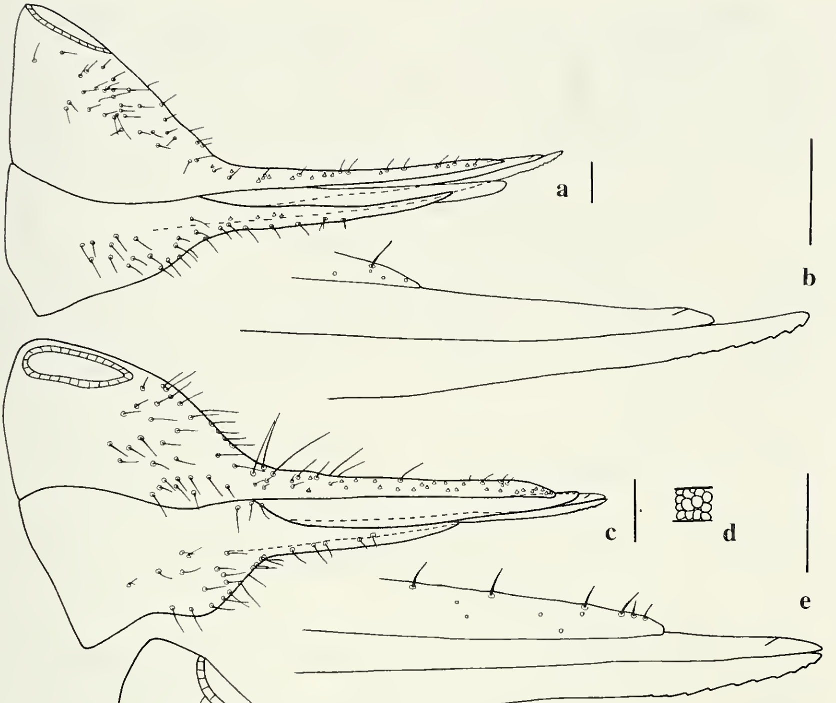

FIG. 39

Calinda spp. a, c, f: female genitalia, in profile, scale lines = 0.1 mm; b, e, g: valvulae dorsalis and ventralis, scale lines = 0.05 mm; d: section of female circumanal ring. a, b: *C. proximata* (Crawford); c, d, e: *C. hollisi* sp. n.; f, g: *C. collaris* (Crawford).

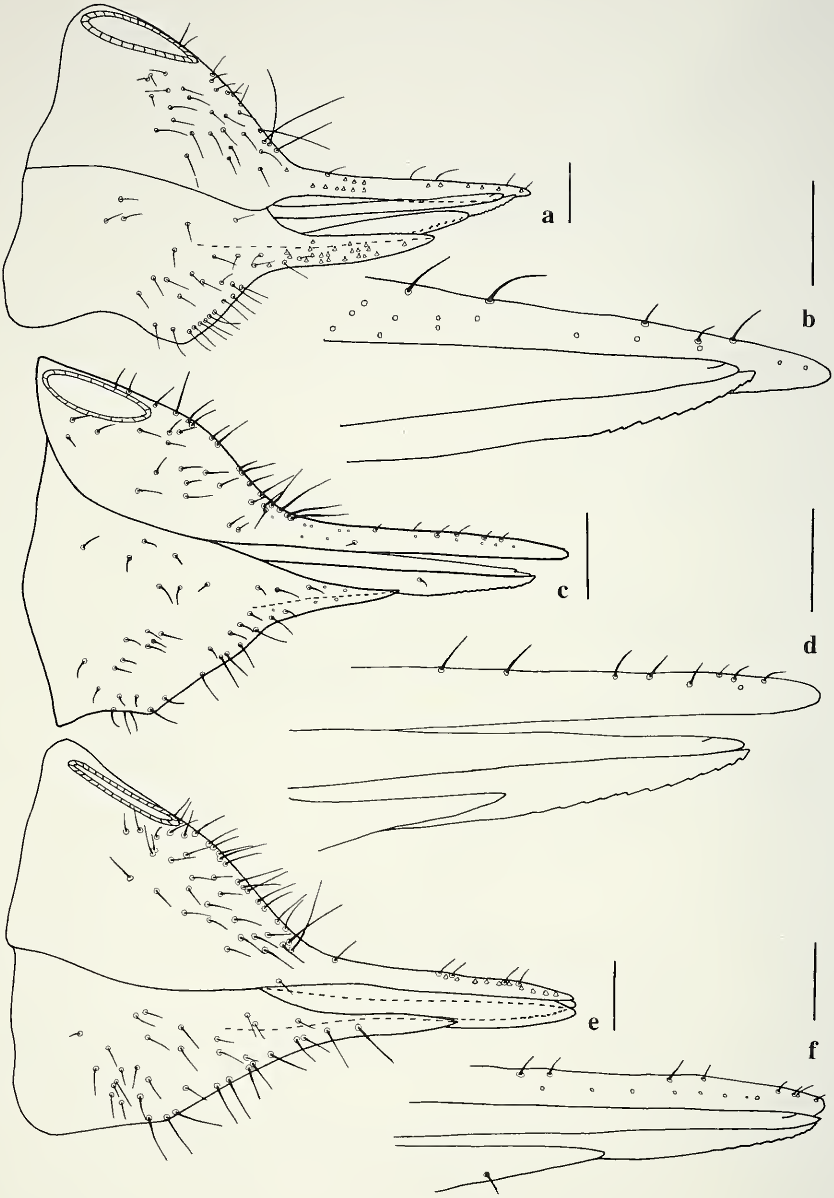

FIG. 40

Calinda spp. a, c, e: female genitalia, in profile, scale lines = 0.1 mm; b, d, f: valvulae dorsalis and ventralis, scale lines = 0.05 mm. a, b: *C. graciliforceps* sp. n.; c, d: *C. branisai* sp. n.; e, f: *C. plaumanni* sp. n.

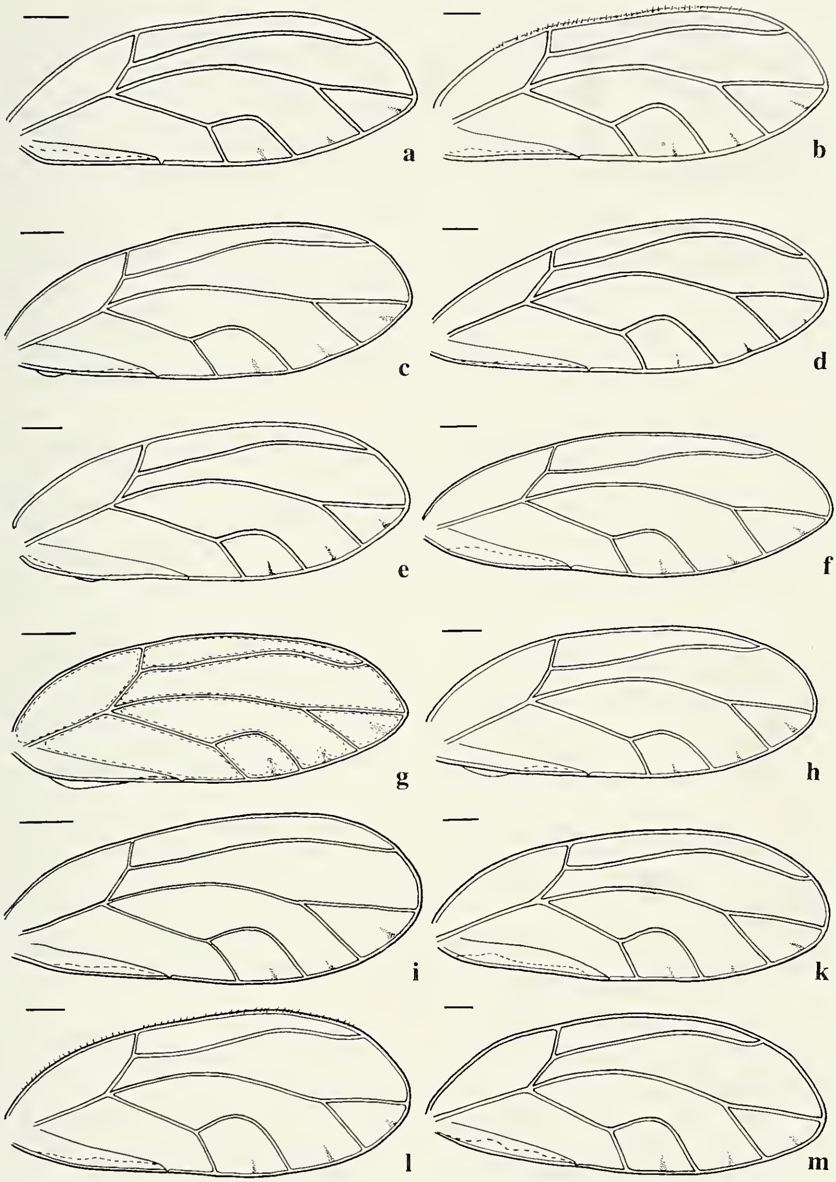

FIG. 41

Calinda spp., forewing. a: *C. broomfieldi* sp. n.; b: *C. magniforceps* (Tuthill); c: *C. peruana* (Tuthill); d: *C. osorii* sp. n.; e: *C. salicifoliae* sp. n.; f: *C. baccharidis* (Tuthill); g: *C. velardei* (Tuthill); h: *C. proximata* (Crawford); i: *C. tuthilli* sp. n.; k: *C. jibara* sp. n.; l: *C. albonigra* sp. n.; m: *C. penai* sp. n.; scale lines = 0.3 mm.

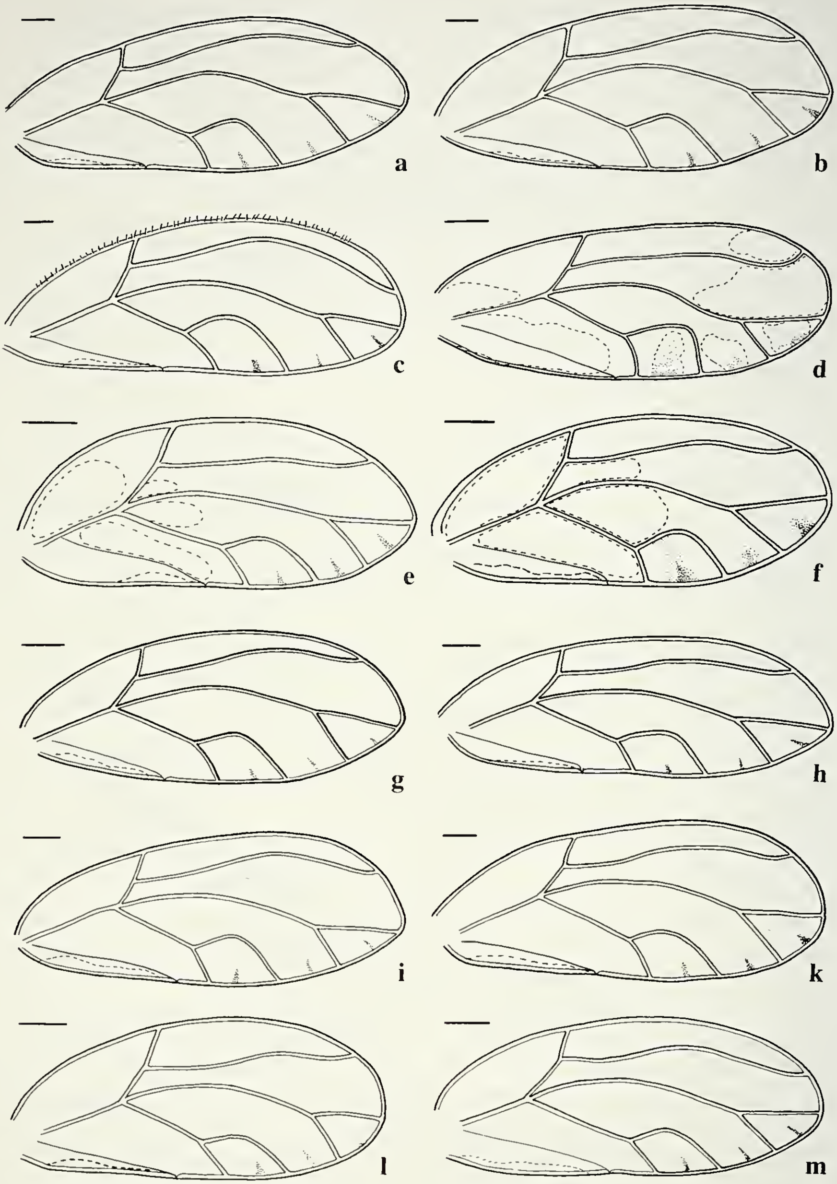

FIG. 42

Calinda spp., forewing. a: *C. gibbosa* (Tuthill) from Peru; b: *C. gibbosa* (Tuthill) from Colombia; c: *C. spatulata* sp. n.; d: *C. huggerti* sp. n.; e, f: *C. peterseni* sp. n.; g: *C. aguilari* (Tuthill); h: *C. inca* sp. n.; i: *C. parviceps* (Tuthill); k: *C. hodkinsoni* sp. n.; l: *C. chionophili* sp. n.; m: *C. patagonica* sp. n.; scale lines = 0.3 mm.

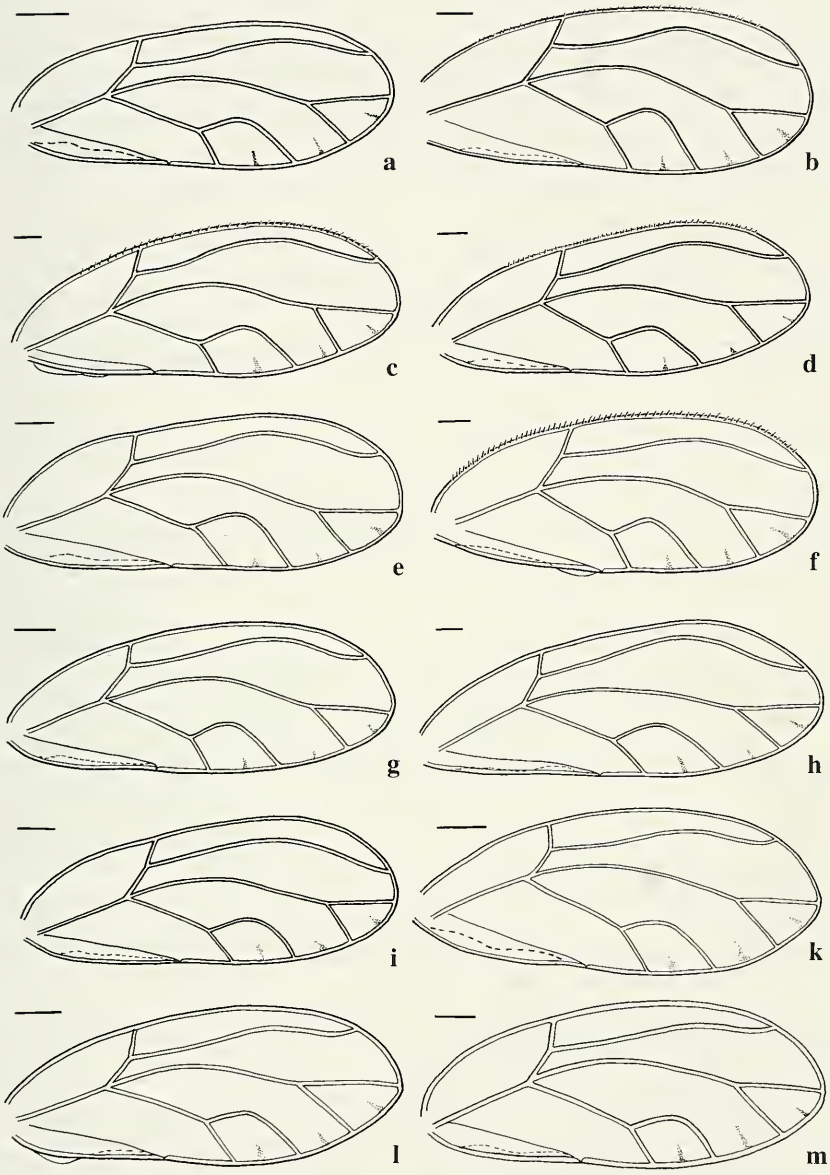

FIG. 43

Calinda spp., forewing. a: *C. reversyi* sp. n.; b: *C. yungas* sp. n.; c: *C. microcephala* sp. n.; d: *C. otavalo* sp. n.; e: *C. brevicauda* sp. n.; f: *C. panamensis* (Brown & Hodkinson); g: *C. trinervis* sp. n.; h: *C. longicollis* sp. n.; i: *C. falciforceps* sp. n.; k: *C. araucana* sp. n.; l: *C. ambigua* sp. n.; m: *C. boldti* sp. n.; scale lines = 0.3 mm.

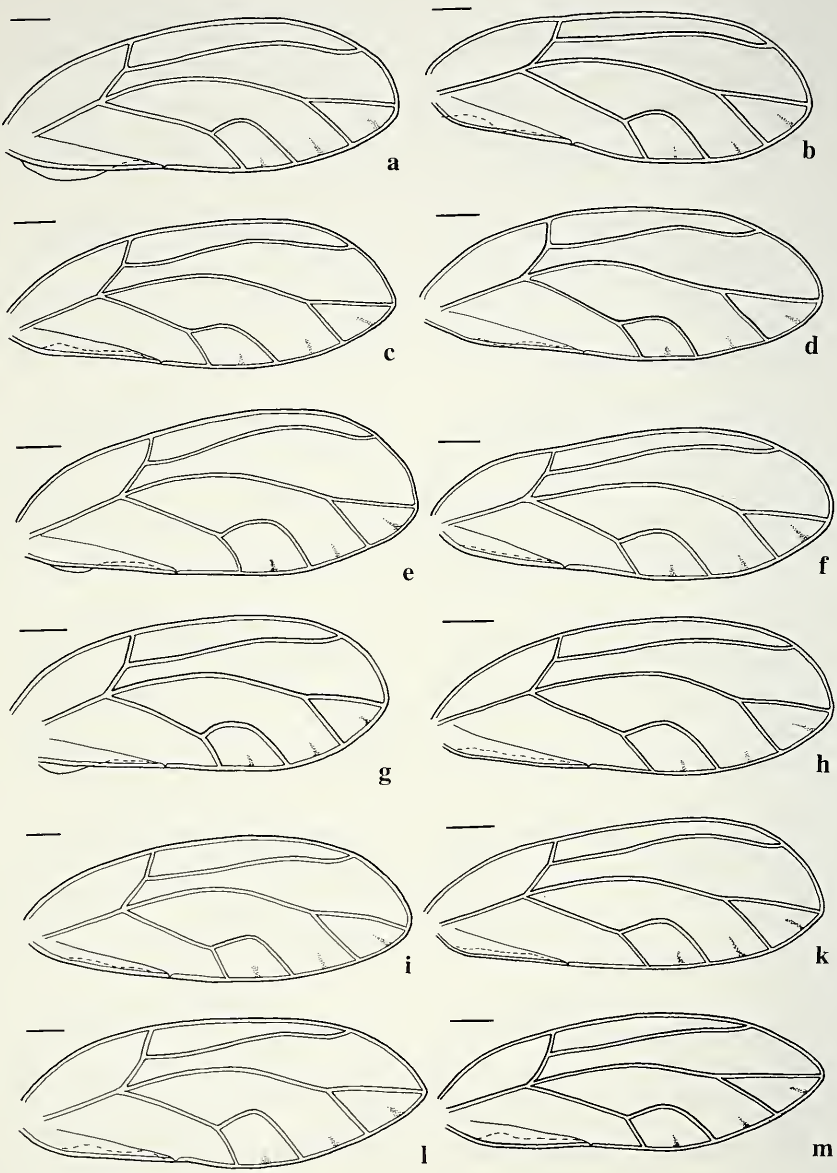

FIG. 44

Calinda spp., forewing. a: *C. pehuenche* sp. n.; b: *C. mendocina* (Kieffer & Jörgensen); c: *C. hollisi* sp. n.; d: *C. antucana* sp. n.; e: *C. testacea* Blanchard; f: *C. graciliforceps* sp. n.; g: *C. longicaudata* sp. n.; h: *C. plaumanni* sp. n.; i: *C. collaris* (Crawford); k: *C. branisai* sp. n.; l: *C. longistylus* (Crawford); m: *C. fumipennis* sp. n. Scale lines = 0.3 mm.

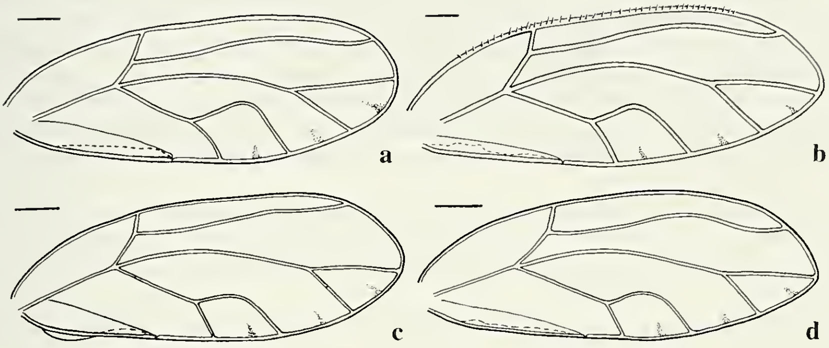

FIG. 45

Calinda spp., forewing. a: *C. gladiformis* sp. n.; b: *C. simoni* (Tuthill); c: *C. beingoleai* (Tuthill); d: *C. muiscas* sp. n.; scale lines = 0.3 mm.

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APPENDIX 1

Variables (measurements in mm) used in the multivariate analyses of males.

Species	HW	WL	WW	a	b	c	d	MP	PL	AEL
C. ambigua	49.0	247.0	82.0	47.0	37.0	37.0	24.0	26.0	31.0	28.0
C. ambigua	66.0	315.0	119.0	60.0	46.0	49.0	37.0	37.0	43.0	40.0
C. ambigua	59.0	308.0	119.0	66.0	45.0	54.0	33.0	34.0	40.0	39.0
C. ambigua	57.0	297.0	110.0	68.0	44.0	48.0	35.0	39.0	40.0	41.0
C. ambigua	56.0	318.0	122.0	70.0	49.0	52.0	31.0	37.0	41.0	41.0
C. ambigua	58.0	305.0	118.0	67.0	50.0	53.0	28.0	38.0	39.0	41.0
C. ambigua	63.0	325.0	131.0	64.0	45.0	56.0	33.0	34.0	42.0	41.0
C. ambigua	46.0	246.0	92.0	48.0	21.0	43.0	26.0	27.0	32.0	29.0
C. ambigua	51.0	252.0	95.0	56.0	39.0	44.0	25.0	28.0	31.0	29.0
C. ambigua	52.0	252.0	99.0	56.0	41.0	42.0	25.0	29.0	32.0	28.0
C. ambigua	54.0	240.0	95.0	51.0	35.0	42.0	25.0	26.0	32.0	29.0
C. ambigua	51.0	263.0	103.0	65.0	45.0	45.0	29.0	30.0	31.0	28.0
C. ambigua	54.0	306.0	110.0	84.0	50.0	51.0	36.0	30.0	29.0	32.0
C. ambigua	59.0	328.0	125.5	69.0	50.0	56.0	38.0	38.0	40.0	42.0
C. ambigua	60.0	319.0	119.0	68.0	45.0	49.0	35.0	37.0	45.0	45.0
C. ambigua	59.0	301.0	113.0	67.0	49.0	55.0	31.0	37.0	40.0	39.0
C. ambigua	55.0	308.0	112.0	65.0	44.0	52.0	29.0	40.0	41.0	42.0
C. ambigua	58.0	255.0	98.0	54.0	37.0	43.0	28.0	31.0	39.0	41.0
C. antucana	59.0	307.0	119.0	84.0	53.0	50.0	32.0	35.0	42.0	37.0
C. antucana	62.0	313.0	118.0	72.0	47.0	51.0	34.0	39.0	42.0	39.0
C. antucana	60.0	291.0	105.0	69.0	49.0	46.0	27.0	39.0	41.0	40.0
C. araucana	56.0	273.0	103.0	51.0	40.0	50.0	31.0	32.0	37.0	34.0
C. araucana	55.0	270.0	103.0	52.0	37.0	45.0	25.0	27.0	36.0	36.0
C. araucana	53.0	272.0	106.0	52.0	40.0	45.0	30.0	28.0	36.0	36.0
C. araucana	52.0	241.0	87.0	30.0	28.0	40.0	21.0	27.0	34.0	31.0
C. araucana	55.0	264.0	102.0	55.0	40.0	46.0	26.0	30.0	36.0	36.0
C. araucana	53.0	251.0	94.0	50.0	37.0	41.0	30.0	28.0	35.0	33.8
C. araucana	52.0	269.0	101.0	60.0	43.0	50.0	27.0	32.0	35.0	33.0
C. araucana	51.0	246.0	89.0	47.0	34.0	43.0	24.0	27.0	34.0	35.0
C. araucana	48.0	228.0	88.0	40.0	36.0	38.0	22.0	27.0	33.0	31.0
C. araucana	52.0	251.0	96.0	49.0	37.0	46.0	31.0	37.0	30.0	33.0
C. araucana	53.0	253.0	100.0	47.0	37.0	43.0	25.0	35.0	38.0	35.0
C. araucana	52.0	240.0	83.0	48.0	36.0	42.0	22.0	28.0	36.0	36.0
C. araucana	56.0	246.0	94.0	45.0	41.0	38.0	26.0	27.0	36.0	32.0
C. araucana	53.0	254.0	92.0	55.0	41.0	41.0	23.0	34.0	30.0	34.0
C. araucana	54.0	296.0	100.0	53.0	35.0	47.0	28.0	30.0	35.0	37.0
C. boldti	61.0	293.0	113.0	55.0	42.0	45.0	29.0	30.0	37.0	36.0
C. boldti	56.0	297.0	125.0	65.0	43.0	53.0	31.0	31.0	40.0	39.0
C. boldti	63.0	332.0	130.0	68.0	52.0	59.0	39.0	35.0	41.0	40.0
C. boldti	65.0	335.0	135.0	70.0	49.0	55.0	38.0	35.0	40.0	30.0

C. mendocina	65.0	318.0	121.0	58.0	48.0	52.0	36.0	35.0	37.0	31.0
C. mendocina	58.0	298.0	110.0	66.0	43.0	47.0	33.0	32.0	32.0	33.0
C. mendocina	56.0	303.0	104.0	65.0	43.0	56.0	27.0	34.0	31.0	31.0
C. mendocina	57.0	321.0	120.0	71.0	47.0	51.0	37.0	34.0	34.0	35.0
C. pehuenche	57.0	306.0	117.0	71.0	46.0	49.0	36.0	34.0	37.0	32.0
C. pehuenche	58.0	313.0	121.0	70.0	43.0	51.0	40.0	35.0	37.0	32.0
C. pehuenche	58.0	298.0	107.0	69.0	45.0	42.0	34.0	36.0	34.0	30.0
C. pehuenche	61.0	326.0	111.0	76.0	49.0	51.0	38.0	37.0	34.0	30.0
C. pehuenche	59.0	308.0	105.0	73.0	49.0	46.0	33.0	34.0	34.0	32.0
C. pehuenche	63.0	327.0	108.0	81.0	46.0	50.0	42.0	40.0	34.0	31.0
C. pehuenche	61.0	312.0	117.0	71.0	47.0	50.0	32.0	38.0	34.0	32.0
C. pehuenche	61.0	316.0	107.0	74.0	45.0	51.0	33.0	35.0	35.0	30.0
C. pehuenche	60.0	304.0	106.0	76.0	50.0	49.0	33.0	37.0	33.0	29.0
C. pehuenche	61.0	299.0	112.0	72.0	47.0	45.0	33.0	43.0	34.0	31.0
C. pehuenche	62.0	309.0	112.0	75.0	48.0	51.0	36.0	43.0	35.0	31.0
C. pehuenche	62.0	301.0	107.0	74.0	43.0	48.0	38.0	37.0	34.0	30.0
C. testacea	54.0	307.0	121.0	70.0	54.0	53.0	33.0	47.0	34.0	25.0
C. testacea	54.0	284.0	108.0	60.0	44.0	50.0	30.0	29.0	32.0	29.0
C. testacea	57.0	317.0	121.0	68.0	47.0	57.0	34.0	31.0	35.0	30.0
C. testacea	53.0	304.0	122.0	67.0	49.0	57.0	33.0	30.0	34.0	30.0
C. testacea	53.0	279.0	104.0	61.0	42.0	52.0	30.0	29.0	33.0	24.0
C. testacea	53.0	281.0	102.0	56.0	41.0	53.0	32.0	29.0	33.0	29.0
C. testacea	51.0	273.0	98.0	53.0	40.0	46.0	29.0	31.0	31.0	28.0
C. testacea	57.0	302.0	118.0	68.0	45.0	55.0	33.0	32.0	34.0	30.0
C. testacea	52.0	288.0	95.0	66.0	44.0	50.0	23.0	29.0	32.0	26.0
C. testacea	52.0	279.0	103.0	61.0	45.0	47.0	26.0	28.0	33.0	30.0
C. testacea	56.0	298.0	123.0	69.0	45.0	53.0	34.0	32.0	34.0	28.0
C. testacea	52.0	257.0	96.0	42.0	38.0	47.0	26.0	30.0	32.0	28.0
C. testacea	55.0	285.0	114.0	62.0	43.0	51.0	32.0	30.0	35.0	29.0
C. testacea	47.0	256.0	94.0	53.0	43.0	47.0	27.0	29.0	31.0	29.0
C. testacea	56.0	285.0	112.0	63.0	44.0	53.0	30.0	34.0	34.0	29.0

APPENDIX 2

Variables (measurements in mm) used in the multivariate analyses of females.

Species	HW	L3	AL	WL	WW	a	b	c	d	TL	FP	FSP
C. ambigua	69.0	21.0	90.0	294.0	105.0	64.0	47.0	53.0	33.0	61.0	109.0	62.0
C. ambigua	63.0	21.0	90.0	292.0	114.0	73.0	52.0	49.0	33.0	60.0	106.0	72.0
C. ambigua	62.0	22.0	101.4	349.0	137.0	56.0	53.0	60.0	36.0	67.0	122.0	92.0
C. ambigua	54.0	21.0	66.2	283.0	114.0	61.0	45.0	46.0	31.0	56.0	85.0	60.0
C. ambigua	66.0	24.0	115.0	364.0	148.0	81.0	55.0	72.0	40.0	65.0	129.0	81.0
C. ambigua	55.0	20.0	72.0	284.0	114.0	63.0	46.0	49.0	33.0	50.0	94.0	64.0
C. ambigua	55.0	20.0	73.8	289.0	116.0	62.0	44.0	52.0	39.0	55.0	93.0	63.0
C. ambigua	65.0	21.0	97.6	339.0	139.0	69.0	51.0	58.0	37.0	64.0	118.0	74.0
C. ambigua	62.0	24.0	98.5	348.0	138.0	78.0	58.0	65.0	39.0	61.0	119.0	87.0
C. ambigua	56.0	19.9	107.1	354.0	136.0	87.0	55.0	68.0	38.0	64.0	128.0	82.0
C. ambigua	59.0	20.0	98.0	341.0	130.0	80.0	56.0	61.0	34.0	58.0	118.0	83.0
C. ambigua	63.0	20.0	96.0	341.0	132.4	76.0	55.0	59.0	37.0	63.0	127.0	92.0
C. ambigua	64.0	19.0	103.0	372.0	129.0	91.0	60.0	66.0	39.0	67.0	123.0	91.0
C. ambigua	61.0	19.1	95.7	332.0	126.0	61.0	45.0	58.0	34.0	62.0	116.0	74.0
C. antucana	63.0	31.0	132.5	335.0	137.0	85.0	59.0	56.0	34.0	73.0	111.0	89.0
C. antucana	59.0	30.0	132.5	323.0	131.0	83.0	57.0	53.0	39.0	73.0	112.0	81.0
C. antucana	63.0	30.0	144.0	328.0	129.0	77.0	56.0	53.0	39.0	76.0	118.0	86.0
C. antucana	60.0	26.0	121.0	281.0	113.0	59.0	43.0	45.0	29.0	69.0	105.0	77.0

C. araucana	56.0	26.0	108.0	299.0	109.0	66.0	51.0	53.0	31.0	62.0	108.0	63.0
C. araucana	52.0	22.0	96.1	267.0	101.0	53.0	43.0	51.0	29.0	57.0	97.0	55.0
C. araucana	56.0	21.0	98.0	282.0	107.0	56.0	43.0	51.0	29.0	57.0	99.0	60.0
C. araucana	57.0	23.0	98.6	277.0	107.0	54.0	42.0	49.0	32.0	55.0	102.0	66.0
C. araucana	54.0	23.0	98.1	274.0	102.0	53.0	43.0	50.0	33.0	57.0	101.0	53.0
C. araucana	56.0	22.0	96.0	269.0	112.0	60.0	45.0	54.0	28.0	56.0	101.0	56.0
C. araucana	53.0	21.0	93.5	251.0	97.0	47.0	36.0	47.0	23.0	53.0	92.0	56.0
C. araucana	49.0	21.0	97.0	258.0	97.0	53.0	39.0	45.0	26.0	54.0	97.0	52.0
C. araucana	58.0	25.0	97.6	307.0	118.0	68.0	42.0	54.0	35.0	62.0	100.0	61.0
C. araucana	53.0	22.0	94.0	263.0	100.0	46.0	38.0	50.0	28.0	53.0	93.0	63.0
C. araucana	53.0	21.0	96.1	258.0	103.0	53.0	43.0	44.0	28.0	52.0	97.0	65.0
C. araucana	54.0	22.0	94.0	258.0	105.0	56.0	40.0	51.0	27.0	57.0	93.0	55.0
C. araucana	56.0	22.5	98.6	280.0	113.0	56.0	44.0	48.0	30.0	60.0	102.0	71.0
C. araucana	67.0	22.0	106.2	361.0	138.0	78.0	59.0	68.0	42.0	73.0	117.0	71.0
C. boldti	55.0	15.0	72.0	252.0	94.0	54.0	39.0	42.0	23.0	47.0	73.0	45.0
C. boldti	56.0	16.5	72.0	285.0	112.0	69.0	45.0	47.0	27.0	52.0	78.0	57.0
C. boldti	58.0	18.0	72.0	293.0	113.0	61.0	44.0	48.0	31.0	54.0	88.0	55.0
C. boldti	61.0	16.5	72.0	296.0	112.0	67.0	48.0	48.0	29.0	50.0	85.0	62.0
C. mendocina	58.0	23.0	101.0	334.0	115.0	80.0	53.0	53.0	33.0	58.0	82.0	78.0
C. mendocina	59.0	24.0	101.0	328.0	122.0	77.0	49.0	54.0	41.0	62.0	84.0	82.0
C. mendocina	56.0	19.0	97.0	318.0	130.0	77.0	47.0	47.0	45.0	50.0	76.0	71.0
C. pehuenche	65.0	21.0	105.8	330.0	123.0	74.0	51.0	52.0	37.0	61.0	85.0	74.0
C. pehuenche	63.0	15.0	103.0	341.0	121.0	81.0	48.0	60.0	36.0	54.0	93.0	77.0
C. pehuenche	63.0	19.0	104.0	346.0	124.0	75.0	49.0	57.0	38.0	62.0	93.0	70.0
C. pehuenche	63.0	18.0	102.0	312.0	111.0	71.0	45.0	54.0	37.0	54.0	83.0	66.0
C. pehuenche	63.0	20.0	100.2	330.0	126.0	79.0	49.0	49.0	42.0	54.0	88.0	75.0
C. pehuenche	62.0	18.0	111.0	333.0	123.0	80.0	51.0	55.0	42.0	62.0	86.0	70.0
C. pehuenche	63.0	15.0	99.0	329.0	123.0	85.0	48.0	59.0	36.0	56.0	88.0	75.0
C. pehuenche	64.0	21.0	114.0	326.0	118.0	79.0	52.0	54.0	36.0	63.0	87.0	79.0
C. pehuenche	63.0	19.0	103.0	335.0	124.0	70.0	49.0	55.0	41.0	60.0	90.0	80.0
C. pehuenche	62.0	19.0	102.6	344.0	130.0	83.0	51.0	57.0	41.0	57.0	92.0	75.0
C. testacea	54.0	23.0	84.0	316.0	129.0	73.0	48.0	55.0	38.0	63.0	119.0	53.0
C. testacea	55.0	24.0	99.0	354.0	128.0	65.0	45.0	60.0	39.0	63.0	117.0	60.0
C. testacea	52.0	24.0	98.1	303.0	116.0	64.0	46.0	54.0	35.0	60.0	106.0	50.0
C. testacea	57.0	24.0	108.6	317.0	119.0	58.0	43.0	60.0	31.0	62.0	108.0	55.0
C. testacea	59.0	25.0	82.4	363.0	133.0	73.0	55.0	67.0	35.0	69.4	122.0	60.0
C. testacea	54.0	24.0	81.0	324.0	118.0	72.0	52.0	63.0	36.0	61.0	118.0	47.0
C. testacea	55.0	20.0	100.0	316.0	111.0	61.0	47.0	57.0	32.0	58.0	99.0	56.0
C. testacea	54.0	22.2	78.9	315.0	111.0	75.0	50.0	55.0	32.0	61.0	103.0	52.0
C. testacea	56.0	24.0	102.0	304.0	118.0	63.0	48.0	59.0	32.0	62.0	96.0	46.0
C. testacea	53.0	23.0	84.1	315.0	115.0	72.0	50.0	50.0	32.0	60.0	98.0	48.0
C. testacea	57.0	23.0	103.3	321.0	121.0	61.0	43.0	54.0	30.0	60.0	99.0	47.0
C. testacea	50.0	20.0	113.8	251.0	92.0	55.0	39.0	48.0	27.0	50.0	84.0	45.0

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A Revision of the Madeiran species of *Geostiba* (Coleoptera: Staphylinidae). Supplement I.

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A Revision of the Madeiran species of *Geostiba* (Coleoptera: Staphylinidae). Supplement I. - A study of recently collected material of Staphylinidae from the Madeiran archipelago yielded 4 new species of the *G. lindrothi* species group, which are described and keyed: *G. ericicola* sp. n., *G. temeris* sp. n., *G. tenebrarum* sp. n. and *G. noctis* sp. n. In addition, further data on the distribution and bionomics of the known Madeiran *Geostiba* are presented.

Key-words: Coleoptera - Staphylinidae - Aleocharinae - *Geostiba* - Madeira - taxonomy - new species - distribution

INTRODUCTION

According to ASSING & WUNDERLE (1996) *Geostiba* Thomson, 1858 is represented in the Madeiran archipelago by 15 endemic species, far more than any other genus of Staphylinidae. However, from the material and further data available the authors concluded that the knowledge of Madeiran Geostiba was far from complete and that further species remained to be discovered.

During a joint excursion to Madeira, Arved Lompe, Lothar Zerche and I collected abundant material of Coleoptera, especially Staphylinidae, among them 1399 specimens of *Geostiba*. Several species previously known only from the type locality were recorded from further localities. In addition, the material contained four new species, all but one from the area east of Encumeada, below the Pico do Jorge.

Below, the collections are abbreviated as follows: DEI = Deutsches Entomologisches Institut Eberswalde; MHNG = Muséum d´histoire naturelle, Genève; cAss = author´s collection.

NEW RECORDS OF THE MADEIRAN SPECIES OF *GEOSTIBA* THOMSON

Geostiba formicarum (Wollaston, 1854)

2 ♂♂, 1 ♀, Rabacal, 1000m, mixed stand of *Erica arborea* and *Laurus* sp., 23.III. 1996, leg. Assing (cAss); 116 ex., same data, leg. Zerche (DEI); 3 ♂♂, 1 ♀, same locality,

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950m, *Laurus* wood, 2.IV.1996, leg. Lompe (cAss); 45 ♂♂, 50 ♀♀, same locality, 950m, stands of *Laurus* sp., *Vaccinium padifolium* and *Erica arborea*, 3.IV.1996, leg. Assing & Lompe (cAss); 68 ex., same data, leg. Zerche (DEI); 1 ex., Ribeira da Janela, N Fanal, 900m, *Laurus* wood in northern exposition, 25.III.1996, leg. Zerche (DEI); 4 ♂♂, 1 ♀, Ribeira da Janela, S Fanal, 1300m, mixed stand of *Laurus* sp., *Vaccinium padifolium* and *Erica arborea*, 25.III.1996, leg. Assing (cAss); 3 ex., same data, leg. Zerche (DEI); 1 ♂, 1 ♀, E Encumeada below Pico do Jorge, 1500m, stand of *Erica* sp. with scattered *Laurus* sp., 26.III.1996, leg. Assing (cAss); 5 ♂♂, 5 ♀♀, E Encumeada below Pico do Jorge, 1300m, stands of Erica sp., *Laurus* sp. and *Vaccinium padifolium*, 26.III.1996, leg. Assing (cAss); 26 ♂♂, 13 ♀♀, E Encumeada below Pico do Jorge, 1300m, in deep and moist *Laurus* litter below old *Laurus* tree, 30.III.1996, leg. Assing (cAss); 4 ♂♂, 6 ♀♀, S Seixal, Ribeira do Seixal, 550m, Laurus wood near stream, 31.III.1996, leg. Assing (cAss); 2 ex., same data, leg. Zerche (DEI).

Before, *G. formicarum* was known only from Rabacal, where this species is apparently very abundant, and from the type localities. The new records show that it is rather widespread at least in the northwest of Madeira proper (west of the Pico Ruivo - Pico Arieiro mountain range), where it inhabits natural woodlands, particularly *Laurus* woods, from an altitude of 550m to 1500m. Part of the specimens collected on 25.III. and 3.IV. were teneral. Larvae, probably of this species, were taken on 25.III.

Geostiba filiformis (Wollaston, 1854)

37 ♂♂, 67 ♀♀, Porto Santo, Pico Facho, 500m, mixed stand of *Pinus* sp., *Laurus* sp. and *Erica arborea*, 1.IV.1996, leg. Assing (cAss); 18 ♂♂, 12 ♀♀, same data, leg. Zerche (DEI); 29 ♂♂, 30 ♀♀, Porto Santo, Pico Branco, 450m, stands of *Pinus* sp., *Laurus* sp. and *Erica* sp., 1.IV.1996, leg. Assing (cAss); 5 ♂♂, 9 ♀♀, same data, leg. Zerche (DEI); 7 ♂♂, 11 ♀♀, Porto Santo, Pico Juliana, 450m, stands of *Pinus* sp., *Laurus* sp. and *Erica* sp., 1.IV.1996, leg. Lompe (cAss); 7 ♂♂, 8 ♀♀, same data, leg. Zerche (DEI).

G. filiformis in now known to inhabit the northern slopes of the four highest peaks in the west of Porto Santo. Together with the adult beetles, many of which were teneral, a number of larvae were collected.

Geostiba arieiroensis Assing & Wunderle, 1996

3 ♂♂, 7 ♀♀, Pico Arieiro, 1600m, mixed stands of *Erica* sp. and *Vaccinium padifolium* in southern exposition [type locality], 21.III.1996, leg. Assing (cAss); 2 ♂♂, 3 ex., same data, leg. Zerche (DEI); 7 ♂♂, 25 ex., Pico Arieiro, 1650m, 21.III.1996, leg. Zerche (DEI).

The species is only known from the type locality.

Geostiba ruivomontis Assing & Wunderle, 1996

42 ♂♂, 40 ♀♀, northern slope of peak of Pico Ruivo, 1850m, stand of *Erica* sp., 29.III.1996, leg. Assing (cAss); 3 ♂♂, 5 ex., western slope of peak of Pico Ruivo, 1850m, stand of Erica sp., 29.III.1996, leg. Zerche (DEI); 41 ♂♂, 39 ♀♀, NE Pico Ruivo, Achada do Teixeira, 1350m, stand of old *Erica arborea* in northern exposition [type locality], 29.III.1996, leg. Assing (cAss); 16 ♂♂, 42 ex., same data, leg. Zerche (DEI).

This species, so far known only from altitudes of 1350 - 1600m, also inhabits the peak of the highest Madeiran mountain, where it was collected together with numerous specimens of *Atheta leileri* (Palm).

Geostiba bicacanaensis Assing & Wunderle, 1996

1 ♀, E Encumeada below Pico do Jorge, 1500m, stand of *Erica* sp. with scattered *Laurus* sp., 26.III.1996, leg. Assing (cAss); 48 ♂♂, 15 ♀♀, E Encumeada below Pico do Jorge, 1300m, stands of *Erica* sp., *Laurus* sp. and *Vaccinium padifolium*, 26.III.1996, leg. Assing (cAss); 5 ♂♂, 12 ex., same data, leg. Zerche (DEI); 3 ♀♀, same locality, 30.III.1996, leg. Assing (cAss); 1 ♂, E Encumeada below Pico do Jorge, 1300m, in deep and moist *Laurus* litter below old *Laurus* tree, 30.III.1996, leg. Assing (cAss); 1 ♂, Seixal, Ribeiro do Seixal, 500m, Laurisilva, on fungus *Clavaria lauri*, 31.III.1996, leg. Zerche (DEI).

This species was formerly known only from Bica da Cana. Interestingly, the length and shape of the spine-like process at the base of the ventral process of the median lobe differs between populations. While it is minute in specimens from the type locality (see Fig. 5a-b in ASSING & WUNDERLE 1996, p. 130), it is short, but distinct in ♂♂ from the area east of Encumeada (Fig. 1c), and conspicuously long in the single ♂ from Seixal (Fig. 1a-b). Either these populations, particularly the one from Seixal, represent different (sub-?) species, or this phenomenon is an expression of intraspecific (clinal?) variation. Since no further differential characters were found,

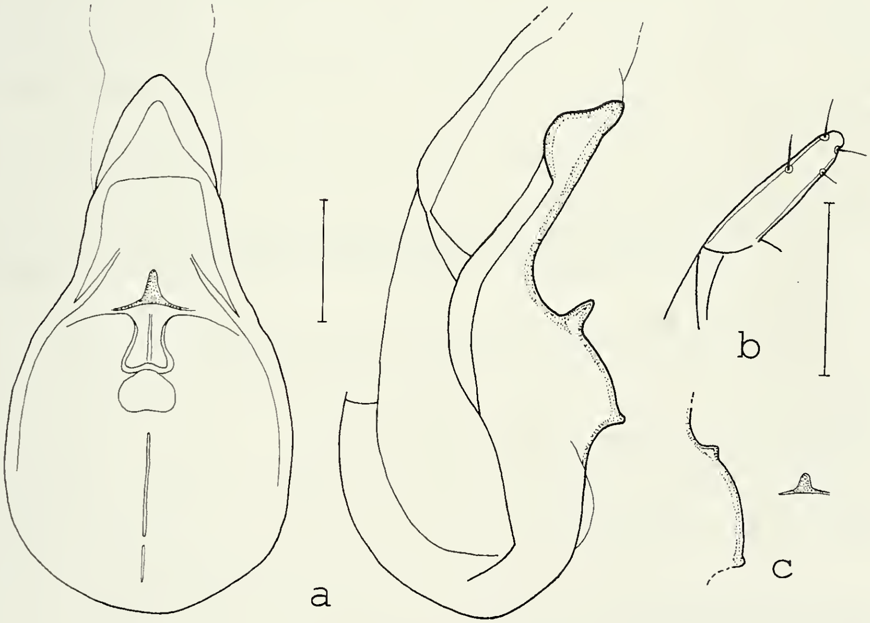

FIG. 1

Geostiba bicacanaensis Assing & Wunderle: aedeagus in ventral and in lateral view (a) and apical lobe of paramere of ♂ from Seixal; spine-like process of median lobe (c) in lateral (left) and ventral view (right) of ♂ from the area east of Encumeada.

however, and without more material from Seixal and from further localities at hand, a description of new taxa is refrained from, and the specimens listed above are treated as representatives of one variable species.

Several of the specimens collected on 26.III. were teneral.

Geostiba portosantoi Franz, 1981

1 ♂, Porto Santo, Pico Facho, 500m, mixed stand of *Pinus* sp., *Laurus* sp. and *Erica arborea*, 1.IV.1996, leg. Assing (cAss).

This is the first record of *G. portosantoi* - previously known only from the Pico Juliana - from the Pico Facho.

Geostiba brancomontis Assing & Wunderle, 1996

2 ♀♀, Porto Santo, Pico Branco, 450m, stands of *Pinus* sp., *Laurus* sp. and *Erica* sp., 1.IV.1996, leg. Assing (cAss).

There had been considerable doubts that the population of this species, apparently a local endemic of the Pico Branco on Porto Santo and previously only once recorded there in 1968, still existed (ASSING & WUNDERLE 1996). This question is now answered, but since only small patches of natural vegetation have remained on the peak of the Pico Branco, *G. brancomontis* must be regarded as highly threatened by extinction.

Geostiba lindrothi Franz, 1981

5♂♂, E Encumeada below Pico do Jorge, 1300m, stands of *Erica* sp., *Laurus* sp. and *Vaccinium padifolium*, 26.III.1996, leg. Assing (cAss); 3♂♂, 2♀♀, same locality, 30.III.1996 leg. Assing (cAss).

This further record indicates that, as far as is known at present, this species may be more widely distributed than the other species of the *lindrothi* group.

Geostiba graminicola Assing & Wunderle, 1996

1 ♂, 3 ♀♀, E Encumeada below Pico do Jorge, 1300m, stands of *Erica* sp., *Laurus* sp. and *Vaccinium padifolium*, 26.III.1996, leg. Assing (cAss); 1 ♂, 1 ♀, same locality, in stand of old *Erica arborea*, 30.III.1996, leg. Assing (cAss).

G. graminicola was previously known only from the type locality near the peak of the Pico Arieiro.

Geostiba vaccinicola Assing & Wunderle, 1996

4 ♀♀, Pico Arieiro, 1650m, stands of *Vaccinium padifolium* [type locality], 21.III.1996, leg. Zerche (DEI).

The known distribution of the species is restricted to the type locality.

Geostiba lauricola Assing & Wunderle, 1996

1 ♂, 8 ♀♀, Ribeira da Janela, N Fanal, 900m, *Laurus* wood in northern exposition [type locality], 25.III.1996, leg. Assing (cAss); 5 ex., same data, leg. Zerche (DEI); 1 ♂, Ribeira da Janela, Fanal, 1000m, mixed stand of *Laurus* and old *Erica arborea*, 25.III.1996, leg. Assing (cAss); 1 ex., same data, leg. Zerche (DEI); 1 ♀, Ribeira da Janela, Fanal, 1100m, in debris near pond, 25.III.1996, leg. Assing (cAss); 39 ♂♂, 26 ♀♀, S Seixal, Ribeira do Seixal, 550m, *Laurus* wood near stream, 31.III.1996, leg. Assing (cAss).

This species, previously known only from the type locality, seems to be widely distributed in the vast *Laurus* woods of the Ribeira da Janela and the Ribeira do Seixal in the northwest of Madeira, where it was in most cases collected together with *G. occulta*. Some of the specimens taken on 31.III. were teneral.

Geostiba caligicola Assing & Wunderle, 1996

1 ♂, northern slope of peak of Pico Ruivo, 1850m, stand of *Erica* sp., 29.III.1996, leg. Assing (cAss); 7 ♂♂, 10 ♀♀, E Pico Ruivo, 1700m, in shade of big rock near, sieved from grass and moist fern debris, 29.III.1996, leg. Assing (cAss); 2 ♀♀, same data, leg. Zerche (DEI).

Apparently, *G. caligicola*, occurs at high altitudes (1600 - 1850m) and is still only known from the northern slope of the Pico Ruivo.

Geostiba occulta Assing & Wunderle, 1996

18 ♂♂, 21 ♀♀, Ribeira da Janela, N Fanal, 900m, *Laurus* wood in northern exposition [type locality], 25.III.1996, leg. Assing (cAss); 4 ♂♂, same data, leg. Zerche (DEI); 11 ♂♂, 39 ♀♀, Ribeira da Janela, Fanal, 1000m, mixed stand of *Laurus* sp. and old *Erica arborea*, 25.III.1996, leg. Assing (cAss); 5 ♂♂, 3 ♀♀, same data, leg. Zerche (DEI); 1 ♀, S Porto Moniz, 400m, *Laurus* wood in northern exposition, 28.III.1996, leg. Assing (cAss); 26 ♂♂, 44 ♀♀, S Seixal, Ribeira do Seixal, 550m, *Laurus* wood near stream, 31.III.1996, leg. Assing (cAss); 8 ♂♂, 7 ♀♀, same data, leg. Zerche (DEI); 1 ♀, Rabacal, 1000m, *Laurus* wood, 23.III.1996, leg. Zerche (cAss).

Previously only known from the type locality, *G. occulta* is obviously widespread in the Ribeira da Janela and the adjacent Ribeira do Seixal in the northwest of Madeira, where it inhabits natural woodland, especially *Laurus* woods at intermediate altitudes (400 - 1000m). On 25.III. and 31.III., several larvae, very likely of this species, were collected together with the adult beetles, many of which were teneral.

Geostiba endogea Assing & Wunderle, 1996

1 ♂, Ribeira da Janela, N Fanal, 900m, *Laurus* wood in northern exposition, 25.III.1996, leg. Zerche (DEI); 8 ♂♂, 5 ♀♀, Ribeira da Janela, Fanal, 1000m, mixed stand of *Laurus* and old *Erica arborea*, 25.III.1996, leg. Assing (cAss); 1 ♀, Ribeira da Janela, S Fanal, 1300m, mixed stand of *Laurus* sp., *Vaccinium padifolium* and *Erica arborea*, 25.III.1996, leg. Assing (cAss); 3 ♂♂, 3 ♀♀, E Encumeada below Pico do Jorge, 1300m, stands of *Erica* sp., *Laurus* sp. and *Vaccinium padifolium*, 26.III.1996, leg. Assing (cAss); 3 ex., same data, leg. Zerche (DEI); 9 ♂♂, 4 ♀♀, same locality, 30.III.1996, leg. Assing (cAss); 1 ♂, same locality, in stand of old *Erica arborea*. 30.III.1996, leg. Assing (cAss); 15 ♂♂, 4 ♀♀, E Encumeada below Pico do Jorge, 1300m, in deep and moist *Laurus* litter below old *Laurus* tree, 30.III.1996, leg. Assing (cAss).

The presently known distribution of *G. endogea* extends from the Ribeiro da Janela to the Pico do Jorge, where it inhabits natural woodland at higher elevations (800 - 1300m). Part of the specimens collected on 25.III. and 30.III. were teneral.

DESCRIPTIONS OF NEW SPECIES

All new species belong to the *G. lindrothi* species group, which are externally highly similar and which can be distinguished with certainty only through examination of the ♂ genitalia. For comparison and further details, the descriptions and illustrations in ASSING & WUNDERLE (1996) are referred to.

In the descriptions, measurements of head width (HW), pronotal width (PW) and length (PL), length of elytra at suture (EL) and the length from labrum to elytral apex (SL) are indicated in µm, the total length from labrum to hind margin of tergite VIII (TL) is given in mm. The arithmetic mean (in parentheses) is given only when more than 20 specimens were available.

In two new species the ♀ sexual characters are not described and ♀♀ are not included in the type series, due to the lack of material or to the impossibility of assigning ♀♀ to the corresponding ♂♂, which was the case for 23 ♀♀ taken below the Pico do Jorge.

Geostiba ericicola sp. n. Figs 2 a - b

HOLOTYPE ♂: `P. Madeira, Achada do Teixeira, *Erica*-Bestand, N-Hang, 1350m, 29.III.1996, leg. Assing´ (cAss).

PARATYPES: 2 ♂♂, same data as holotype (cAss, MHNG).

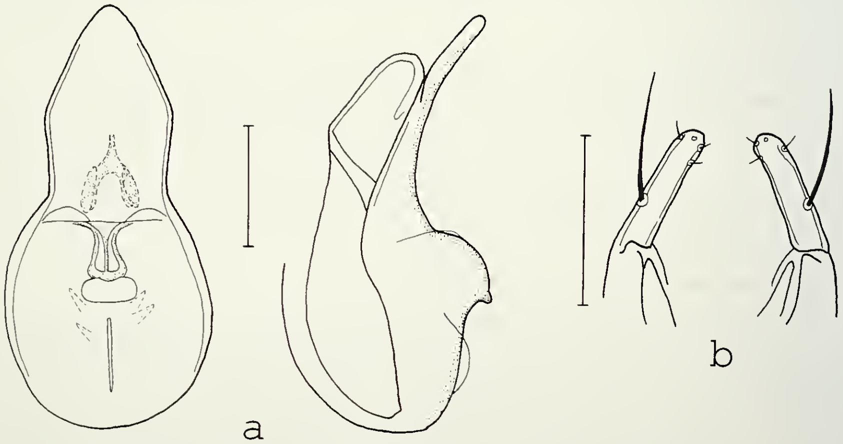

FIG. 2

Geostiba ericicola sp. n. (HT): aedeagus in ventral and in lateral view (a); apical lobes of parameres. Scales: 0.1 mm.

DESCRIPTION: Measurements (n = 3): HW: 255-270; PW: 285-300; PL: 270-285; EL: 180-195; SL: 830-845; TL: 2.2-2.3.

Colour and external morphology as in *G. lindrothi* Franz.

♂: median lobe with ventral process of characteristic shape, in ventral view slightly constricted at base and in lateral view very slender, not widened at apex as in the other species of the *G. lindrothi* group; internal sac with some very weakly sclerotized spines (Fig. 2a); apical lobe slender and distinctly parallel, its setal pattern similar to *G. vaccinicola* Assing & Wunderle (Fig. 2b).

♀: unknown.

Derivatio nominis: The name refers to the vegetation of the type locality.

DISTRIBUTION AND BIONOMICS: At present, *G. ericicola* is known only from the type locality (which is also the type locality of *G. ruivomontis* Assing & Wunderle and of *Stenus ruivomontis* Assing & Wunderle), where it was sieved from soil and litter in an old stand of *Erica arborea* in northern exposition.

Geostiba temeris sp. n. Figs 3 a - d

HOLOTYPE ♂: `P. Madeira, O Encumeada-Pass, b. Pico do Jorge, 1300m, 30.III.1996, leg. Assing´ (cAss).

PARATYPES: 9 ♂♂, 8 ♀♀, same data as holotype (coll. Assing); 5 ♂♂, same locality as holotype, 26.III.1996 (cAss, coll. Wunderle, DEI, MHNG).

DESCRIPTION: Measurements (n = 22): HW: 255-270 (261); PW: 285-320 (295); PL: 265-285 (273); EL: 180-195 (187); SL: 785-845 (814); TL: 2.1-2.4 (2.2).

Colour and external morphology as in *G. lindrothi* Franz.

♂: internal sac of median lobe with two long rows of distinctly sclerotized spines (Fig. 3a); apical lobe of paramere shaped as in Fig. 3b, with one long and three short setae, the subapical short seta slightly longer than the apical ones.

♀: hind margin of sternum VIII distinctly concave posteriorly, but less so than in *G. graminicola* Assing & Wunderle (Fig. 3d); spermatheca as in Fig. 3c.

Derivatio nominis: The name (genitive of temus (lat.): darkness) refers to the subterraneous habitat of the species.

DISTRIBUTION AND BIONOMICS: All of the type series was sieved beneath an old *Laurus* tree in northern exposition from an extremely deep (> 20 cm) *Laurus* litter layer and the soil below (see above for further details regarding the type locality); in the same samples *G. bicacanaensis* Assing & Wunderle and numerous specimens of *G. endogea* Assing & Wunderle and *G. formicarum* (Wollaston) were present. The ovaries of 3 ♀♀ contained mature eggs.

Geostiba tenebrarum sp. n. Figs 4 a - d

HOLOTYPE ♂: `P. Madeira, O Encumeada-Pass, b. Pico do Jorge, 1300m, 30.III.1996, leg. Assing´ (cAss).

PARATYPES: 5 ♂♂, same data as holotype; 5 ♂♂, same locality as holotype, 26.III.1996 (cAss, coll. Wunderle, MHNG).

DESCRIPTION: Measurements (n = 11): HW: 280-300; PW: 315-350; PL: 300-325; EL: 195-210; SL: 845-935; TL: 2.2-2.5.

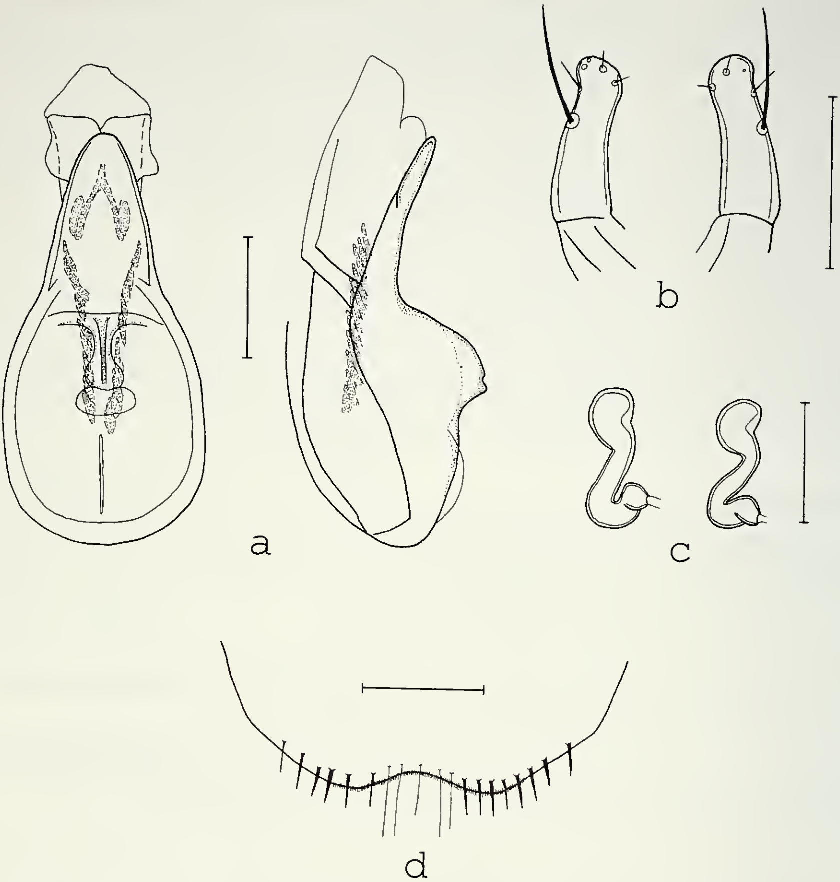

FIG. 3

Geostiba temeris sp. n. (♂: HT): aedeagus in ventral and in lateral view (a); apical lobes of parameres (b); spermathecae (c); hind margin of ♀ sternite VIII (d). Scales: 0.1 mm.

Colour and general external morphology as in *G. lindrothi* Franz, but larger (see measurements).

♂: internal sac of median lobe with two rows of 3 - 5 distinctly sclerotized spines (Fig. 4a); shape of median lobe similar to *G. lindrothi*; apical lobe with setal pattern similar to *G. lindrothi*, but slenderer and more parallel than in that species, and insertion of long seta usually nearer to base of apical lobe (Figs 4b-d).

Derivatio nominis: tenebrarum (genitive of tenebrae (lat.): darkness) alludes to the subterraneous habitat.

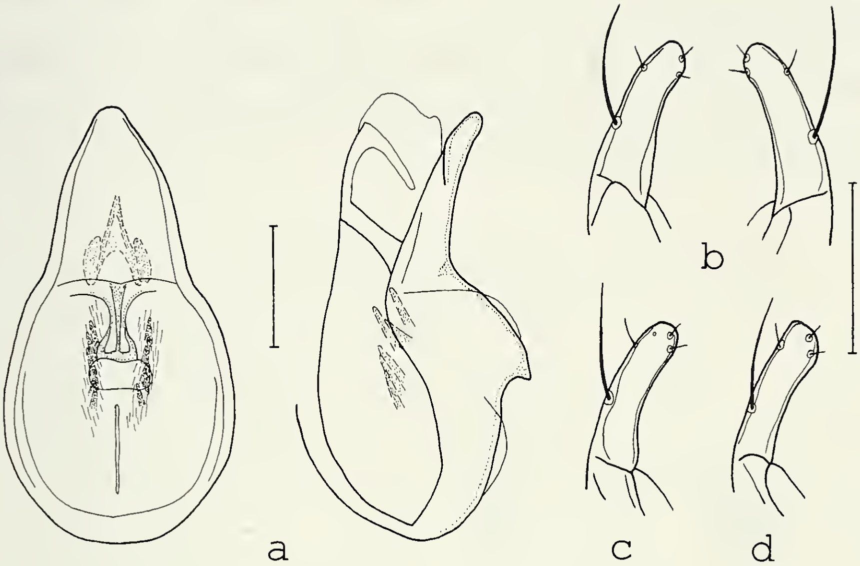

FIG. 4

Geostiba tenebrarum sp. n.: aedeagus (HT) in ventral and in lateral view (a); apical lobes of parameres (b: HT, c - d: PTT). Scales: 0.1 mm.

DISTRIBUTION AND BIONOMICS: The type specimens were sieved near the type locality of *G. temeris* sp. n. from soil and litter in mixed stands of *Laurus* sp., *Vaccinium padifolium* and *Erica* sp., together with *G. bicacanaensis*, *G. endogea*, *G. lindrothi* and the following new species.

Geostiba noctis sp. n. Figs 5 a - d

HOLOTYPE ♂: `P. Madeira, O Encumeada-Pass, b. Pico do Jorge, 1300m, 30.III.1996, leg. Assing´ (cAss).

PARATYPES: 1 ♂, 1 ♀, same locality as holotype, 26.III.1996, leg. Zerche (DEI, cAss).

DESCRIPTION: Measurements (n=3): HW: 285-295; PW: 330-340; PL: 300-320; EL: 195-205; SL: 875-920; TL: 2.2-2.4.

Colour and general external morphology as in *G. lindrothi* Franz, but larger, similar in size to *G. tenebrarum* sp. n. (see measurements); eyes without trace of pigmentation, a character shared only with the smaller *G. graminicola*.

♂: ventral process of median lobe of characteristic shape, in ventral view broadly triangular and pointed at apex, in lateral view relatively broad; internal sac with pair of dark, but relatively weakly sclerotized assemblages of structures (Fig. 5a); apical lobe of paramere relatively shorter and stouter than in the related species, subapical external seta short, but distinctly longer than the apical ones (Fig. 5b).

♀: hind margin with an uninterrupted row of stout bristles (Fig. 5d); spermatheca as in Fig. 5c.

Derivatio nominis: noctis (genitive of nox (lat.): night, darkness) refers to the subterraneous habitat.

DISTRIBUTION AND BIONOMICS: The types were collected under the same circumstances as *G. tenebrarum* sp. n.

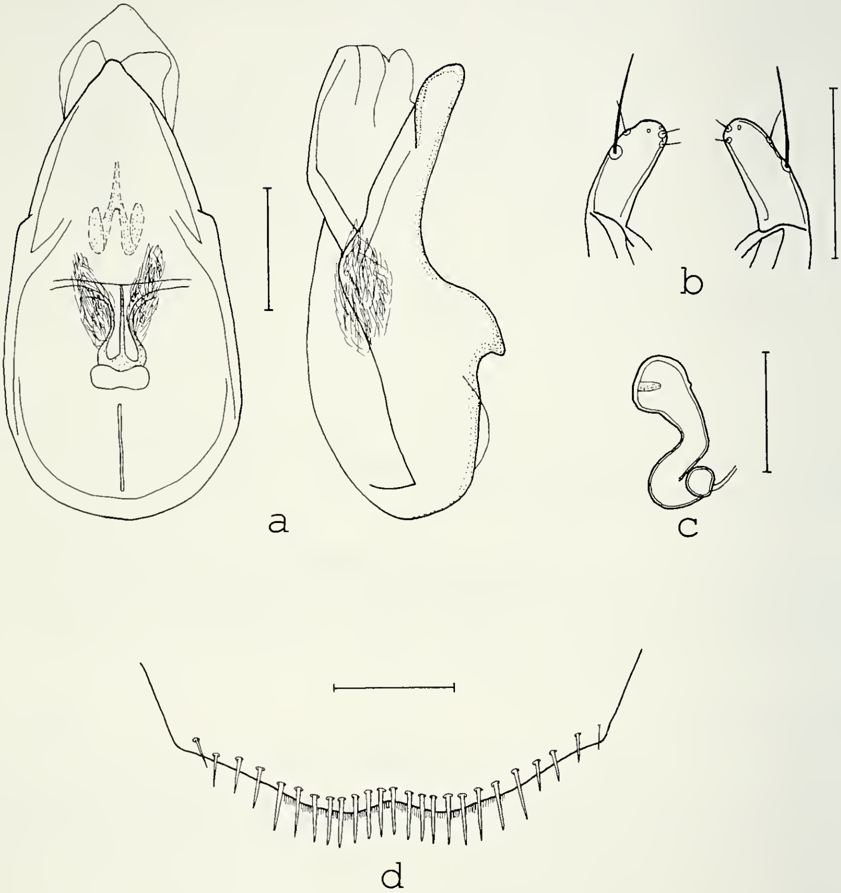

FIG. 5

Geostiba noctis sp. n. (HT): aedeagus in ventral and in lateral view (a); apical lobes of paramere (b); spermatheca (c); hind margin of ♀ sternite VIII (d). Scales: 0.1 mm.

KEY TO THE SPECIES OF MADEIRAN *Geostiba*

In order to account for the new species the diagnostic key in ASSING & WUNDERLE (1996) is supplemented as follows:

11. ♂: apex of paramere with one long and three short setae. 11a
– ♂: apex of paramere with two long and two short setae. 14
11a ♂: internal sac of median lobe with two rows of distinctly sclerotized spines. 11b
– ♂: internal sac of median lobe without such spines. 11c
11b On average larger species: HW >275, PW >315, PL >290, SL >845. ♂: internal sac with two short rows, each composed of ca. 3 - 6 spines (Fig. 4a); apical lobe of paramere as in Figs 4b-d. ♀: unknown. . . . . *G. tenebrarum* sp. n.
– On average smaller: HW <275, PW <325, PL <290, SL <850. ♂: internal sac with two long rows, each consisting of ca. 10 or more spines (Fig. 3a); apical lobe of paramere as in Fig. 3b. ♀: hind margin of sternite VIII distinctly concave (Fig. 3d); spermatheca as in Fig. 3c. . . . . *G. temeris* sp. n.
11c Eye rudiments without trace of pigmentation; relatively large species. ♂: ventral process of median lobe in ventral view broadly triangular and with pointed apex, in lateral view relatively broad; internal sac with pair of dark assemblages of diffuse structures (Fig. 5a); apical lobe of paramere relatively stout and short (Fig. 5b). ♀: hind margin of sternite VIII with uninterrupted row of stout bristles (Fig. 5d); spermatheca as in Fig. 5c. . . . . *G. noctis* sp. n.
– Eye rudiments with traces of pigmentation; mostly smaller species. ♂: ventral process of median lobe of different shape, internal sac without such pair of dark assemblages; apical lobe of paramere relatively longer and slenderer. ♀: row of stout bristles at posterior margin of sternite VIII interrupted in the middle. (Note that the ♀ of *G. ericicola* is unknown.) 11d
11d ♂: ventral process of median lobe in ventral view constricted basally, in lateral view not widened apically (Fig. 2a); apical lobe of paramere distinctly parallel and slender (Fig. 2b). . . . . *G. ericicola* sp. n.
♂: ventral process of different shape, not constricted basally and broader in ventral view; apical lobe of paramere not distinctly parallel, often stouter. 12

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REFERENCE

ASSING, V. & WUNDERLE, P., 1996. A Revision of the Madeiran species of the genus *Geostiba* Thomson, 1858 (Coleoptera: Staphylinidae). *Revue suisse de Zoologie* 103: 119-150.

REVUE SUISSE DE ZOOLOGIE 104 (2): 357-370; juin 1997

Catalogue révisé des types d'amphibiens et de reptiles du Muséum d'histoire naturelle de Genève

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Revised catalogue of type specimens of amphibians and reptiles in the Natural History Museum, Geneva. - The herpetological collection of the Natural History Museum of Geneva comprises type material of 188 nominal species and subspecies of amphibians and reptiles. In two cases (*Triturus cristatus cucleocephalus*, *Rana temporaria obtusirostris*) lectotypes are designated. More detailed data, taxonomic comments and remarks concerning the description of a taxon or the origin of type specimens are found under http://www.ville-ge.ch/musinfo/mhng/erpi/cat1.htm

INTRODUCTION

Le premier catalogue du matériel type de la collection des vertébrés inférieurs du Muséum d'histoire naturelle de Genève (MHNG) a été publié par MAHNERT (1976). Ce travail, consacré à l'ensemble des types de poissons, amphibiens et reptiles, mentionnait 143 taxa nominaux, dont 26 espèces et sous-espèces de poissons. L'augmentation énorme du nombre des types de poissons en vingt ans, reflétant l'activité scientifique des chercheurs du Muséum, la collaboration étroite avec des spécialistes et de nombreux échanges avec d'autres institutions qui ont permis de recevoir du matériel type d'auteurs contemporains, nécessite une publication ultérieure.

En ce qui concerne les amphibiens, le précédent inventaire signalait des spécimens types appartenant à 72 taxa. Pour sept d'entre eux, toutes des formes nominales de grenouilles africaines (Hyperoliidae: *Afrixalus leucostictus*, *Callixalus pictus*, *Hyperolius chrysogaster*, *H. frontalis*, *H. karissimbiensis intermedius*, *H. lateralis subolivaceus*, et *H. leucotaenius*) décrites par LAURENT (1950, 1952), le statut de type n'a pu être retenue. En revanche, deux sous-espèces nominales de *Hyperolius viridiflavus* (Duméril & Bibron) décrites par LAURENT (1950, comme *H. karissimbiensis* ssp.) et omises dans MAHNERT (1976) se sont avérées être des spécimens types. De surcroît, la présente révision à permis de déceler deux séries types de sous-espèces nominales décrites par FATIO (1872), *Triturus cristatus cucleocephalus* et *Rana temporaria obtusirostris*, ce qui a conduit à la désignation de lectotypes. Parmi le matériel qui n'a pas été recensé dans l'ancien catalogue figuraient également neuf

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holotypes du genre *Leptodactylodon* Andersson (AMIET 1971*a*, *b*) contenant six espèces nouvelles qui ont été déposé au MHNG en 1973 à titre provisoire; ce matériel est définivement entré dans la collection seulement après la rédaction de l'ancien catalogue. En plus, 38 espèces et deux sous-espèces ont été décrites depuis 1976, ce qui augmente le nombre de types d'amphibiens y compris une acquisition (*Ptychadena broadleyi*) à 117.

Quinze espèces et neuf sous-espèces de reptiles décrites depuis la publication du premier catalogue, une acquisition par échange (*Echis carinatus aliaborri*), un néotype (*Coluber gemonensis*) ainsi qu'une sous-espèce (*Vipera ammodytes montandoni* = *V. a. meridionalis*) qui n'était pas mentionnée dans MAHNERT (1976) ont enrichi les collections du MHNG. Un taxon qui figurait dans l'ancien catalogue, *Elaphis dione* var. *temporalis* Jan, 1863, un synonyme d'*Elaphe dione* (Pallas) est un nomen nudum. Le nombre actuel des séries types d'espèces et de sous-espèces s'élève à 71.

Les taxa sont classés par ordre alphabétique des noms de genres, d'espèces et de sous-espèces, aux seins des ordres. Un astérisque précédant les noms scientifiques signifie que la forme en question est mentionnée par Mahnert (1976). Le symbole ° indique qu'un commentaire se trouve à l'adresse http://www.ville-ge.ch/musinfo/mhng/erpi/cat1.htm. D'autres informations (référence originale, sexe, provenance précise, collectionneur, date de capture, numéros de terrain etc.) sont également disponibles à la même adresse.

AMPHIBIA

I. URODELA

***Hydromantes italicus bonzanoi** Bruno & Bologna, 1973 = *H. ambrosii bonzanoi*
Paratypes MHNG 1520.12, 1520.13.

***Hydromantes italicus strinatii** Aellen, 1958 = *H. strinatii*
Holotype MHNG 926.16. Paratypes MHNG 935.13 et 903.21.

Triturus cristatus cuclocephalus Fatio, 1872 = *T. c. cristatus* (Laurenti, 1768)
Lectotype (*hoc loco*) MHNG 718.96a (♂), Suisse: Genève; V. Fatio (sans précisions et date). Paralectotypes MHNG 718.96b-c (♂ et adult), mêmes données que le lectotype.

II. ANURA

*°**Afrixalus congicus paradorsalis** Perret, 1960 = *A. paradorsalis*
Holotype MHNG 991.50. Paratypes MHNG 991.51-62, 991.65-68, 991.69-83 et 991.97-100.

***Afrixalus dorsalis laciniosus** Perret, 1960
Holotype MHNG 1035.39. Paratypes MHNG 1035.40-51.

*__Afrixalus lacteus__ Perret, 1976
Holotype MHNG 1506.58. Paratypes MHNG 1506.59-92 et 1506.96-97.

*°**Arthroleptis adelphus** Perret, 1966
Holotype MHNG 1042.12. Paratypes MHNG 1042.13-28.

*__Arthroleptis pyrrhoscelis__ Laurent, 1952
Paratypes MHNG 1055.7-9.

*__Arthroleptis troglodytes__ Poynton, 1963
Paratypes MHNG 1511.74-75.

° **Astylosternus fallax** Amiet, 1977
Holotype MHNG 1562.73.

°**Astylosternus laurenti** Amiet, 1977
Holotype MHNG 1562.77.

Astylosternus montanus Amiet, 1977
Holotype MHNG 1562.76.

Astylosternus nganhanus Amiet, 1977
Holotype MHNG 1562.71.

Astylosternus perreti Amiet, 1977
Holotype MHNG 1562.72.

Astylosternus ranoides Amiet, 1977
Holotype MHNG 1562.78.

°**Astylosternus rheophilus** Amiet, 1977 = *A. r. rheophilus*
Holotype MHNG 1562.74.

Astylosternus rheophilus tchabalensis Amiet, 1977
Holotype MHNG 1562.75.

Astylosternus schioetzi Amiet, 1977
Holotype MHNG 1562.79.

°**Aubria occidentalis** Perret, 1994
Holotype MHNG 2129.17. Paratypes MHNG 1189.19-20, 1522.28, 1558.47, 2129.15-16 et 2129.18.

*°**Bufo bambutensis** Amiet, 1972 = *Werneria bambutensis*
Holotype MHNG 1253.92.

Bufo danielae Perret, 1977
Holotype MHNG 1519.90. Paratypes MHNG 1519.91-95, 1537.56-71 et 1545.52-57.

*__Bufo funereus upembae__ Schmidt & Inger, 1959 = *B. fuliginatus* De Witte, 1932
Paratypes : MHNG 1020.82-87.

*__Bufo pentoni tihamicus__ Balletto & Cherchi, 1973 = *B. tihamicus*
Paratypes MHNG 1185.79-84.

*__Bufo perreti__ Schiøtz, 1963
Paratype MHNG 1054.10.

*__Bufo scorteccii__ Balletto & Cherchi, 1970
Paratypes MHNG 1240.32-33.

*__Bufo tandyi__ Amiet, 1972 = *Werneria tandyi*
Holotype MHNG 1253.93.

*__Cardioglossa gratiosa__ Amiet, 1972
Holotype MHNG 1253.85.

*__Cardioglossa melanogaster__ Amiet, 1972
Holotype MHNG 1253.86.

*__Cardioglossa oreas__ Amiet, 1972
Holotype MHNG 1253.87.

*__Cardioglossa trifasciata__ Amiet, 1972
Holotype MHNG 1253.88.

*__Cardioglossa venusta__ Amiet, 1972
Holotype MHNG 1253.89.

*__Chrysobatrachus cupreonitens__ Laurent, 1951
Paratypes MHNG 1054.83-84 et 1054.86-93.

°**Epipedobates bilinguis** Jungfer, 1989
Paratypes MHNG 2247.1-43.

*°**Hylarana acutirostris longipes** Perret, 1960 = *H. longipes*
Holotype MHNG 986.24. Paratypes MHNG 986.25-26.

Hylarana amnicola Perret, 1977
Holotype MHNG 1551.43. Paratypes MHNG 917.29, 958.28, 1009.57-58, 1009.64-66, 1009.78, 1019.65-66, 1019.79-81 et 1551.44-51.

Hylarana asperrima Perret, 1977
Holotype MHNG 1551.52. Paratypes MHNG 1551.53-67 et 1551.69-72.

*°**Hymenochirus boettgeri camerunensis** Perret & Mertens,1957
Paratypes MHNG 917.94-95.

***Hymenochirus boulengeri** De Witte, 1930
Paratypes MHNG 1018.37-42.

Hyperolius bopeleti Amiet, 1979
Holotype MHNG 2031.2.

***Hyperolius castaneus constellatus** Laurent, 1951
Paratypes MHNG 1202.89-100 et 1203.1-13.

°**Hyperolius endjami** Amiet, 1980
Holotype MHNG 2006.77. Paratypes MHNG 2006.78-91.

Hyperolius karissimbiensis francoisi Laurent, 1950 = *H. viridiflavus francoisi*
Paratypes MHNG 2008.19-44.

Hyperolius karissimbiensis xanthogrammus Laurent, 1950 = *H. viridiflavus xanthogrammus*
Paratypes MHNG 2007.4-10.

***Hyperolius lateralis bogerti** Laurent, 1952
Paratypes MHNG 1202.23-27.

***Hyperolius lateralis bururiensis** Laurent, 1950
Paratypes MHNG 1206.19-23.

***Hyperolius lateralis capnodogaster** Laurent, 1951
Paratypes MHNG 1202.64-68.

***Hyperolius lateralis guibei** Laurent, 1951
Paratypes MHNG 1203.14-18.

***Hyperolius lateralis kochi** Laurent, 1951
Paratypes MHNG 1207.43-47.

***Hyperolius lateralis pulcherrimus** Laurent, 1952
Paratypes MHNG 1204.43-47.

*°**Hyperolius leucotaenius allogynus** Laurent, 1952 = *H. allogynus*
Paratypes MHNG 1204.92-96.

*°**Hyperolius mosaicus** Perret, 1959
Holotype MHNG 965.12. Paratypes MHNG 965.13-21.

***Hyperolius nasutus igbettensis** Schiøtz, 1963
Paratypes MHNG 1039.12-15.

***Hyperolius nitidulus aureus** Perret, 1966 = *H. viridiflavus aureus*
Holotype MHNG 1038.39. Paratypes MHNG 1038.40-100.

***Hyperolius nitidulus bangwae** Perret, 1966 = *H. viridiflavus bangwae*
Holotype MHNG 1039.2. Paratypes MHNG 960.63-87 et 1039.3-9.

*°**Hyperolius obstetricans** Ahl, 1931 = *Alexteroon obstetricans*
Néotype MHNG 995.48.

***Hyperolius platyceps olbrechtsi** Laurent, 1952
Paratypes MHNG 1204.48-57.

***Hyperolius viridiflavus hybridus** Laurent, 1951
Paratypes MHNG 1204.82-86.

Kassina arboricola Perret, 1985
Holotype MHNG 2130.98. Paratype MHNG 2130.99.

*°**Kassina argyreivittis ruandae** Laurent, 1956 = *K. senegalensis ruandae*
Paratypes MHNG 1205.53-60.

Leptodactylodon albiventris bueanus Amiet, 1980
Holotype MHNG 2031.12.

Leptodactylodon axillaris Amiet, 1971
Holotype MHNG 2031.8.

Leptodactylodon bicolor Amiet, 1971
Holotype MHNG 2031.7.

Leptodactylodon erythrogaster Amiet, 1971
Holotype MHNG 2031.11.

***Leptodactylodon mertensi** Perret, 1959
Holotype MHNG 951.39.

Leptodactylodon ornatus Amiet, 1971 = *L. o. ornatus*
Holotype MHNG 2031.10.

Leptodactylodon ornatus permaculatus Amiet, 1971
Holotype MHNG 2031.3.

Leptodactylodon ovatus orientalis Amiet, 1971
Holotype MHNG 2031.4.

Leptodactylodon perreti Amiet, 1971
Holotype MHNG 2031.5. Paratypes MHNG 1525.7-8.

Leptodactylodon polyacanthus Amiet, 1971 = *L. p. polyacanthus*
Holotype MHNG 2031.9.

Leptodactylodon polyacanthus punctiventris Amiet, 1971
Holotype MHNG 2031.6.

***Leptopelis anchietae nordequatorialis** Perret, 1966 = *L. nordequatorialis*
Holotype MHNG 1004.8. Paratypes MHNG 953.17-22, 953.24 et 1004.9-12.

***Leptopelis modestus fiziensis** Laurent, 1973 = *L. fiziensis*
Paratypes MHNG 1205.33-42.

***Leptopelis ocellatus schiotzi** Laurent, 1973
Paratypes MHNG 1202.84-88.

*°**Leptopelis rufus** Reichenow, 1874
Néotype MHNG 1324.65.

***Megalixalus leptosomus upembae** Laurent, 1941 = *Afrixalus upembae*
Paratypes MHNG 1197.9-12.

***Nectophrynoides cryptus** Perret, 1971
Paratypes MHNG 1221.62-67 et 1240.30-31.

***Nectophrynoides minutus** Perret, 1972
Paratypes MHNG 1240.42-43.

*°**Nectophrynoides mirei** Perret, 1971 = *Wolterstorffina mirei*
Holotype MHNG 1182.77. Paratypes MHNG 1182.78-79.

°**Osornophryne antisana** Hoogmoed, 1987
Holotype MHNG 2278.49.

°**Osornophryne guacamayo** Hoogmoed, 1987
Holotype MHNG 2278.17. Paratype MHNG 2278.18.

Petropedetes parkeri Amiet, 1983
Paratypes MHNG 1521.60, 1521.64-68 et 1521.78.

***Petropedetes perreti** Amiet, 1973
Holotype MHNG 1253.90.

Phlyctimantis boulengeri Perret, 1986
Holotype MHNG 2238.56. Paratypes MHNG 1189.35-41, 1468.99-100 et 2238.57-69.

***Phrynobatrachus aelleni** Loveridge, 1955 = *P. plicatus* (Günther, 1859)
Holotype MHNG 1056.97.

***Phrynobatrachus anotis** Schmidt & Inger, 1959
Paratypes MHNG 1053.62-73.

*°**Phrynobatrachus cornutus annulatus** Perret, 1966 = *P. annulatus*
Holotype MHNG 961.81. Paratype MHNG 961.82.

***Phrynobatrachus cricogaster** Perret, 1957
Holotype MHNG 923.31. Paratypes MHNG 923.32-33.

***Phrynobatrachus cryptotis** Schmidt & Inger, 1959
Paratypes MHNG 981.98-100 et 982.1-3.

***Phrynobatrachus maculiventris** Guibé & Lamotte, 1958 = *P. fraterculus* (Chabanaud, 1921)
Paratypes MHNG 961.96-97.

***Phrynobatrachus parogoensis** Loveridge, 1955 = *P. accraensis* (Ahl, 1923)
Holotype MHNG 1056.98.

Phrynobatrachus taiensis Perret, 1988
Holotype MHNG 1469.81. Paratype MHNG 1469.82.

***Phrynobatrachus werneri hylaios** Perret, 1959 = *P. hylaios*
Holotype MHNG 964.100. Paratypes MHNG 962.24-42, 962.44-68 et 965.22.

*°**Pseudophryne vivipara** Tornier, 1905 = *Nectophrynoides viviparus*
Néotype MHNG 1221.55.

Ptychadena broadleyi Stevens, 1972
Paratypes MHNG 1545.64-65.

***Ptychadena chrysogaster** Laurent, 1954
Paratypes MHNG 1054.50-55.

Ptychadena ingeri Perret, 1991
Paratype MHNG 2526.39.

°**Ptychadena largeni** Perret, 1994
Holotype MHNG 2513.31. Paratypes MHNG 2513.32-60.

Ptychadena mahnerti Perret, 1996
Holotype MHNG 2547.67. Paratypes MHNG 1543.39 et 2547.68-79.

Ptychadena nana Perret, 1980
Paratypes MHNG 2074.35-38.

Rana cerigensis Beerli, Hotz, Tunner, Heppich & Uzzell, 1994
Holotype MHNG 2543.92. Paratype MHNG 2543.93.

Rana cretensis Beerli, Hotz, Tunner, Heppich & Uzzell, 1994
Holotype MHNG 2543.90. Paratype MHNG 2543.91.

°**Rana (Paa) hazarensis** Dubois & Khan, 1979
Paratype MHNG 1597.19.

***Rana (Ptychadena) obscura** Schmidt & Inger, 1959 = *P. obscura*
Paratypes MHNG 1954.15-20.

***Rana ruwenzorica** Laurent, 1972
Paratypes MHNG 1203.68-77.

Rana shqiperica Hotz, Uzzell, Günther, Tunner & Heppich, 1987
Paratypes MHNG 2388.74.

°**Rana temporaria obtusirostris** Fatio, 1872 = *R. t. temporaria* Linné, 1758
Lectotype (*hoc loco*) MHNG 689.40 (♀), Suisse: Zermatt; V. Fatio (sans date). Paralectotype MHNG 806.23 (♂), Suisse: St. Gotthard; V. Fatio (sans date).

***Rana (Ptychadena) upembae** Schmidt & Inger, 1959 = *P. upembae*
Paratypes MHNG 1054.11-14.

*°**Schoutedenella sylvatica** Laurent, 1954 = *Arthroleptis sylvatica*
Paratypes MHNG 1041.6-17.

*°**Werneria mertensiana** Amiet, 1976
Holotype MHNG 1253.91.

°**Xenopus amieti** Kobel, du Paquier, Fischberg & Gloor, 1980
Holotype MHNG 2030.80. Paratypes MHNG 2030.81-89.

°**Xenopus andrei** Loumont, 1983
Holotype MHNG 2088.32.

°**Xenopus boumbaensis** Loumont, 1983
Holotype MHNG 2088.31.

*°**Xenopus laevis sudanensis** Perret, 1966
Holotype MHNG 1017.74. Paratypes MHNG 1017.75-100 et 1018.34.

Xenopus longipes Loumont, 1991
Holotype MHNG 2497.10. Paratypes MHNG 1496.58-100 et 2497.1-9.

°**Xenopus pygmaeus** Loumont, 1986
Holotype MHNG 2196.4. Paratypes MHNG 2238.27-29.

Xenopus ruwenzoriensis Tymowska & Fischberg, 1973
Lectotype MHNG 2238.15. Paralectotypes MHNG 2238.16 et 2238.18-21.

III. GYMNOPHIONA

Chthonerpeton onorei Nussbaum, 1986
Holotype MHNG 2251.6.

REPTILIA

I. SAURIA

*°**Ablepharus duruarum** Monard, 1949 = *Panaspis duruarum*
Lectotype MHNG 1055.69.

*__Chamaeleo eisentrauti__ Mertens, 1968 = *Ch. (Trioceros) eisentrauti*
Paratype MHNG 1229.99.

Chamaeleo quadricornis gracilior Böhme & Klaver, 1981
Paratypes MHNG 1365.7-9.

Cnemaspis (Ancylodactylus) gigas Perret, 1986
Paratypes MHNG 2236.15-16.

Cnemaspis (Ancylodactylus) petrodroma Perret, 1986
Paratypes MHNG 2236.17-19.

*°**Cnemaspis quattuorseriatus dilepis** Perret, 1963 = *C. (Ancylodactylus) dilepis*
Holotype MHNG 1005.69.

*__Eremias (Taenieremias) benuensis__ Monard, 1949 = *Acanthodactylus guineensis* (Boulenger, 1887)
Lectotype MHNG 1055.62. Paralectotypes MHNG 2547.20-23.

Garzoniella longipes Perret, 1976 = *Stenodactylus sthenodactylus* (Lichtenstein, 1823)
Holotype MHNG 1520.20.

Liolaemus poecilochromus Laurent, 1986
Paratypes MHNG 2213.74-75.

*__Lygodactylus angularis dysmicus__ Perret, 1963 = *L. gutturalis dysmicus*
Holotype MHNG 1005.72.

Lygodactylus (Lygodactylus) blancae Pasteur, 1995
Paratype MHNG 2541.29.

Lygodactylus (Millotisaurus) intermedius Pasteur, 1995
Paratype MHNG 2541.30-31.

*°**Lygosoma rohdei** L. Müller, 1910 = *Leptosiaphos (Lacertaspis) rohdei*
Néotype MHNG 963.40.

*__Mabuia striata angolensis__ Monard, 1937 = *M. angolensis*
Paratype MHNG 858.95.

*__Millotisaurus mirabilis__ Pasteur, 1962 = *Lygodactylus (Millotisaurus) mirabilis*
Paratype MHNG 993.78.

*__Neusticurus tuberculatus__ Shreve, 1935 = *N. ecpleopus* Cope, 1876
Paratype MHNG 1069.96.

*°**Panaspis amieti** Perret, 1973 = *Leptosiaphos (L.) amieti*
Holotype MHNG 1240.47. Paratypes MHNG 1240.48.

*°**Panaspis fuhni** Perret, 1973 = *Leptosiaphos (L.) fuhni*
Holotype MHNG 963.41.

***Saurodactylus mauritanicus brosseti** Bons & Pasteur, 1957
Paratype MHNG 993.24.

°**Varanus yemenensis** Böhme, Joger & Schätti, 1989
Paratypes MHNG 2329.62, 2445.90 et 2585.34.

Vilcunia periglacialis Cei & Scolaro, 1982
Paratypes MHNG 2152.45-46.

II. OPHIDIA

***Atheris katangensis** De Witte, 1953
Paratype MHNG 1324.50.

***Atractaspis coalescens** Perret, 1960
Holotype MHNG 975.65.

Bothriechis mahnerti Schätti & Kramer, 1991 = *B. punctatus mahnerti*
Holotype MHNG 2459.47. Paratypes MHNG 2250.21, 2459.44-46 et 2459.48.

***Brachyophis revoili krameri** Lanza, 1966
Paratype MHNG 1324.13.

*°**Calamaria picteti** Peracca, 1900 = *Calamaria bicolor* Schlegel *in* Duméril, Bibron & Duméril, 1854
Holotype MHNG 748.36.

*°**Cemophora copei** Jan, 1863 = *C. coccinea* (Blumenbach, 1788)
Holotype MHNG 524.74.

Coluber cypriensis Schätti, 1985
Holotype MHNG 2206.30.

Coluber florulentus perreti Schätti, 1988
Holotype MHNG 1464.45.

°**Coluber gemonensis** Laurenti, 1768 = *Hierophis gemonensis*
Néotype MHNG 1357.70.

***Coluber viridiflavus kratzeri** Kramer, 1970 = *Hierophis viridiflavus* (Lacépède, 1789)
Paratypes MHNG 1324.77-89 et 1324.90-93.

Dipsadoboa flavida broadleyi Rasmussen, 1989
Paratype MHNG 1356.95.

Dipsadoboa underwoodi Rasmussen, 1993
Paratypes MHNG 918.59, 1512.13-14 et 1512.16.

*°**Dryophis pulverulentus** Jan, 1863 = *Ahaetulla p. pulverulentus* (Duméril, Bibron & Duméril, 1854)
Holotype MHNG 1198.71.

Echis carinatus aliaborri Drewes & Sacherer, 1974 = *E. pyramidum aliaborri*
Paratype MHNG 2236.26.

*°**Echis carinatus leakeyi** Stemmler & Sochurek, 1969 = *E. pyramidum leakeyi*
Paratypes MHNG 1324.26-30.

***Echis carinatus sochureki** Stemmler, 1969
Paratypes MHNG 1324.31-36 et 1324.38-43.

Eirenis levantinus Schmidtler, 1993
Paratypes MHNG 1406.38, 1406.40-42, 1406.44, 2423.62, 2423.98, 2425.78 et 2425.79.

Eirenis modestus cilicius Schmidtler, 1993
Paratypes MHNG 1405.52, 1406.37 et 1406.43.

*°**Elapotinus picteti** Jan, 1862
Holotype MHNG 279.37.

*°**Enicognathus humberti** Jan, 1863 = *Sibynophis subpunctatus* (Duméril, Bibron & Duméril, 1854)
Holotype MHNG 523.92.

*°**Enicognathus occipitalis** Jan, 1863 = *Rhadinaea occipitalis*
Syntype MHNG 179.42.

*°**Erythrolamprus aesculapii bizona** Jan, 1863 = *E. bizona*
Syntype MHNG 464.30.

***Erythrolamprus aesculapii dicranta** Jan, 1863 = *E. a. monozona* Jan, 1863
Syntype MHNG 524.49.

*°**Glauconia hamulirostris** Nikolskij, 1907 = *Leptotyphlops hamulirostris*
Lectotype MHNG 1326.72.

***Helicops pastazae** Shreve, 1934
Paratype MHNG 1069.97.

*°**Homalosoma melanocephalum** Jan, 1862 = *Rhynchocalamus melanocephalus*
Syntype MHNG 1246.77.

Leptotyphlops perreti Roux-Estève, 1979
Holotype MHNG 1453.11. Paratype MHNG 1453.10.

Liophis cobella dyticus Dixon, 1983
Paratype MHNG 1567.87.

*°**Liophis reginae ornata** Jan, 1863 = *L. miliaris semiaureus* (Cope, 1862)
Holotype MHNG 180.39.

***Liparophis bedoti** Peracca, 1904 = *Opisthotropis balteatus* (Cope, 1895)
Holotype MHNG 677.45.

***Micrurus mertensi** Schmidt, 1936
Paratype MHNG 1327.93.

***Naja tripudians** var. **paucisquamis** Peracca, 1900 = *Naja sumatrana* F. Müller, 1887
Holotype MHNG 748.43.

***Natrix natrix lanzai** Kramer, 1970
Holotype MHNG 1324.94. Paratypes MHNG 1324.95-100, 1325.1-17, 1325.19-23, 1383.89-99, 1396.9 et 1399.7.

*°**Oligodon petronellae** Roux, 1917
Holotype MHNG 767.2.

***Opisthotropis kuatunensis** Pope, 1928
Paratype MHNG 1369.46.

***Oxyrhopus bicolor** Peracca, 1904 = *Clelia bicolor*
Holotype MHNG 677.47.

°**Porthidium almawebi** Schätti & Kramer, 1993
Holotype MHNG 2248.12. Paratypes MHNG 2248.10-11, 2248.13-16, 2410.36-39 et 2440.37-41.

***Psammophis elegans univittatus** Perret, 1961
Holotype MHNG 1213.92. Paratypes MHNG 1213.93 et 1213.95.

***Rabdosoma trivirgatum** Jan, 1862 = *Atractus trilineatus* Wagler, 1828
Syntype MHNG 524.2.

*°**Trachischium laeve** Peracca, 1904
Holotype MHNG 677.46.

°**Trimeresurus albolabris insularis** Kramer, 1977
Paratypes MHNG 2007.1-2.

Trimeresurus albolabris septentrionalis Kramer, 1977
Holotype MHNG 1404.31. Paratypes 1400.24-39, 1404.2-30 et 1404.32-47.

Trimeresurus macrops Kramer, 1977
Holotype MHNG 1400.85. Paratypes MHNG 1400.72-84 et 1400.86-100.

*__Tropidonotus (Eutainia) natrix picturata__ Jan, 1863 = *Natrix natrix scutata* (Pallas, 1771)
Syntype MHNG 523.97.

Vipera ammodytes montandoni Boulenger, 1904 = *V. a. meridionalis* Boulenger, 1903
Syntype MHNG 1342.35.

*__Vipera aspis zinnikeri__ Kramer, 1958
Paratypes MHNG 1324.14-25.

Vipera latastei gaditana Saint Girons, 1984
Holotype MHNG 1352.99. Paratypes MHNG 840.4, 1352.100, 1353.1 et 1353.4-5.

*°__Vipera latastei monticola__ Saint Girons, 1954 = *V. monticola*
Syntype MHNG 1353.7.

*__Vipera latifii__ Mertens, Darevskij & Klemmer, 1967 = *V. raddei latifii*
Paratypes MHNG 1324.44-45.

Xenochrophis flavipunctatus schnurrenbergeri Kramer, 1977
Holotype MHNG 1377.44. Paratypes MHNG 1377.39-72.

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REVUE SUISSE DE ZOOLOGIE 104 (2): 371-378; juin 1997

Palpigrades à répartition indo-madécasse et morphogenèse postembryonnaire de *Koeneniodes madecassus* Remy

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Indo-Malagasian Palpigradida and postembryonic morphogenesis in *Koeneniodes madecassus* Remy. - *Koeneniodes madecassus* Remy, 1950, described from Nosy Be Island, NW of Madagascar, is the first species of the Order collected in Seychelles. The same species had been previously recorded from Mauritius, La Réunion, Sri Lanka, Hong Kong and Java. Other representatives of the genera *Eukoenenia* and *Koeneniodes* show a similar distribution, suggesting an oriental origin.
A comparison of the opisthosomian glandular material and joint setae in the juvenile and adult females was carried out for the first time, leading to a better knowledge of the postembryonic morphogenesis in this species.

Key-words: Palpigradida - Seychelles - Indian and Malagasian realms - postembryonic morphogenesis.

INTRODUCTION

La découverte, sur La Digue, du premier Palpigrade des Seychelles, *Koeneniodes madecassus* Remy, 1950 décrit du NO de Madagascar (Nosy Be) est l'occasion d'évoquer les affinités entre les faunes endogées anciennes des régions indo-malaise et madécasse, et le peuplement des îles de l'Océan indien occidental, relais possibles entre le continent asiatique et Madagascar pour les micro-Arthropodes terrestres, et aussi de proposer une description complémentaire de l'espèce et de son développement post-embryonnaire.

INVENTAIRE FAUNISTIQUE

A la suite des récoltes de Paul Remy sur Madagascar, La Réunion et Maurice, à l'aide d'une loupe frontale, la faune des Palpigrades de ces îles fut considérée comme l'une des plus riches: alors que l'Ordre ne comptait que 22 espèces, le premier mémoire de REMY (1950) en accroissait l'effectif de près de 50%. La densité des Palpigrades, évaluée d'après la moyenne horaire des captures fut, à Madagascar, de 0,58 en 1947 et de 0,28 en 1957, à La Réunion de 1,01 et à Maurice de 3,25. Ces

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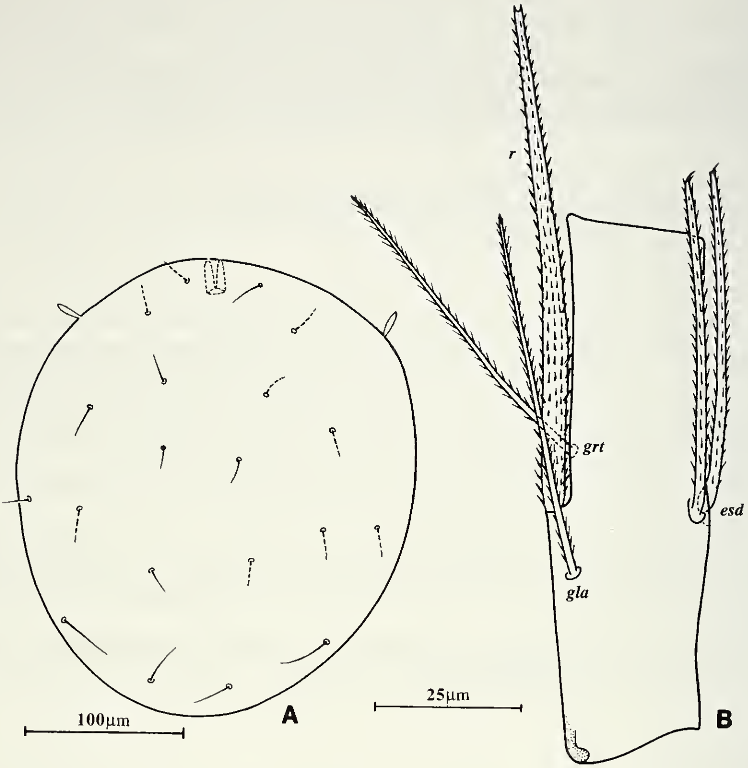

Fig. 1

Koeneniodes madecassus Remy, femelle holotype d'Hellville, MNHN Paris, Zoologie-Arthropodes. A. Bouclier prosomien. - B. Basitarse IV gauche, face antérieure. *esd* = soies épaisses distales; *gla* = soie grêle antérieure; *grt* = soie grêle tergale; *r* = soie raide.

divergences ont sans doute pour origine la plus ou moins grande abondance de biotopes favorables, en fonction des facteurs climatiques temporels et locaux. Les 596 spécimens récoltés constituaient la collection, de loin la plus nombreuse jamais rassemblée à l'époque, mais la diversité biologique fut inversement proportionnelle à la taille des populations: trois espèces seulement, *Eukoenenia florenciae* (Rucker), *Koeneniodes frondiger* et *K. madecassus* Remy, présentes sur des Mascareignes et aussi sur Madagascar, mais là parmi 17 autres des genres *Eukoenenia* (14), *Koeneniodes* (1), *Leptokoenenia* (1) et *Triadokoenenia* (1).

Remy (1958) a expliqué cette disparité par les faibles dimensions des Mascareignes avec des biotopes beaucoup moins variés que ceux de la Grande Ile.

L'identité des faunes de La Réunion et de Maurice témoignerait de l'origine commune du peuplement; d'autres espèces ont pu y être introduites, mais auraient

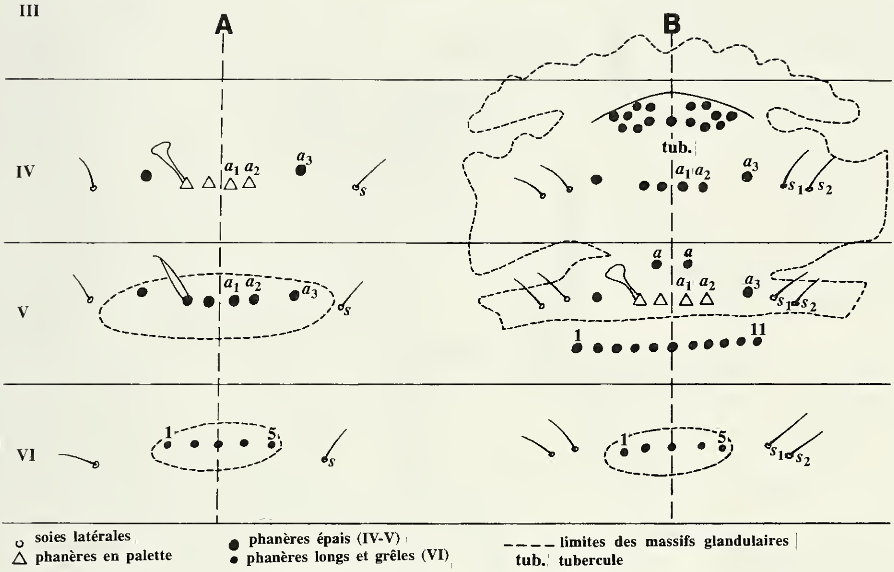

FIG. 2

Koeneniodes madecassus Remy, diagrammes: évolution des phanères et des massifs glandulaires des sternites opisthosomiens IV à VI. A. = femelle juvénile *B*; B. = femelle adulte. s, s_1, s_2 = soies latérales; triangles = phanères en palette des urosternites IV, chez la femelle juvénile et V, chez la femelle adulte; grands cercles pleins = phanères épais de type glandulaire (sur IV et V); petits cercles pleins = phanères longs et grêles (sur VI); tub = tubercule; - - - - - - = limites des massifs glandulaires.

subi une sélection sévère n'en épargnant que trois, représentées par des femelles (220 au total) sans doute parthénogénétiques. L'activité humaine («guerre des épices»), avec transport des plantules d'une île à l'autre pourrait être responsable des introductions, d'autant que ces Palpigrades n'ont été trouvés, comme à Madagascar, que dans des milieux fréquentés par l'Homme: jardins à Tuléar pour *E. florenciae*; villages et cimetière pour *Koeneniodes frondiger*; borne-fontaine à Hellville et pompe d'une féculerie à Ambanja pour *Koeneniodes madecassus*. C'est aussi le cas du spécimen des Seychelles (vieux cimetière).

REMY (1950) a immédiatement rapproché son *Eukoenenia sakalava* de *E. angusta*, du Siam. Plus tard (1960, 1961), étudiant ses récoltes de la région de Pondichery et du Sri Lanka, il constate la proche parenté de son espèce malgache *E. necessaria* avec son *E. angusta tamula* récoltée en pleine nature à 7 km au Sud de Pondichéry, et la présence au Sri Lanka de *E. chartoni* et *Koeneniodes madecassus*, décrits de Madagascar. Les affinités entre les faunes indienne et madécasse lui apparaissent indiscutables et il y voit «un excellent argument en faveur d'une connexion ancienne entre Madagascar et l'Indo-Malaisie» qui apparaît, avec plus ou moins de précision, dans les reconstitutions des paléogéographes.

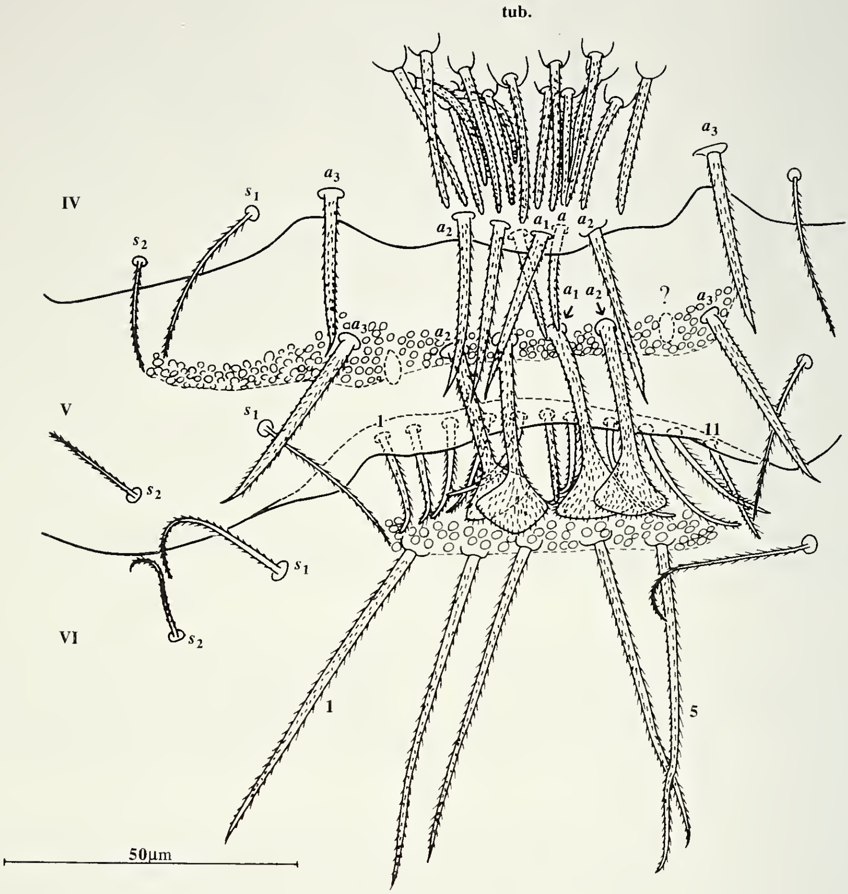

FIG. 3

Koeneniodes madecassus Remy, femelle adulte des Seychelles, sternites IV à VI de l'opisthosome. a = phanère épais de la paire antérieure du sternite V. a_1, a_2, a_3 = phanères épais ou en palette (homologues) des sternites IV et V. s_1, s_2 = phanères grêles latéraux des sternites IV à VI; tub. 1-15 = tubercule du sternite IV et ses phanères; 1-11 = phanères de la rangée postérieure du sternite V; 1-5 = phanères longs et grêles du sternite VI; ? = formation paire non identifiée du sternite IV. Les massifs glandulaires sont localisés par leur marge postérieure seulement (voir le diagramme, fig. 2).

Mes propres observations, résumées ici et présentées dans l'ordre chronologique, confirment celles de REMY en les étendant au Nord de l'Inde, au Sud de la Chine et à des îles de l'Archipel indo-australien.

1°. *Eukoenenia florenciae* (Rucker): 2 femelles adultes au Népal, dans des sites non dégradés des Siwalik, ce qui exclut la possibilité d'une introduction accidentelle de cette forme unisexuée qui est le Palpigrade ayant la plus vaste aire de répartition connue (1979:901), mais souvent au voisinage de l'Homme; la forme (ou espèce) bisexuée, *Eukoenenia hanseni* (Silvestri), dont les femelles sont identiques à *E. florenciae*, est actuellement limitée au Mexique.

2°. *Koeneniodes* cf. *frondiger* Remy: une femelle juvénile *B* en Nouvelle-Guinée Papouasie (1981:741).

3°. *Koeneniodes berndi* Condé: 2 femelles adultes, 3 femelles juvéniles *B*, un mâle juvénile *C*, un immature *A*, au Sabah (anc. Bornéo septentrional); l'espèce la plus voisine de *frondiger* et le premier représentant de sexe mâle signalé chez *Koeneniodes* (1988:741).

4°. *Eukoenenia angusta hindua* Condé (= *Eukoenenia* sp. Remy, 1960, Pondichéry): 4 femelles adultes, 1 femelle juvénile *B*, 3 mâles juvéniles *C*, 6 immatures *A* de Varasani (Benarès), très voisine de *E. necessaria* Remy, 1960, de Périnet, sinon identique à elle (1989:413).

5°. *Koeneniodes frondiger* Remy: 3 femelles adultes et une juvénile *B*, à Java et 4 femelles adultes à Bali (1990:684).

6. *Koeneniodes madecassus* Remy: une femelle juvénile *B* à Java (1990:686) et une autre à Hong Kong, New Territories (1993:29).

7°. *Koeneniodes frondiger* Remy: 5 mâles adultes, 1 mâle juvénile *C*, 17 femelles adultes, 7 femelles juvéniles *B*, 6 immatures *A*, sur Sulawesi, les premières populations bisexuées connues (1994).

Dans ce contexte, la présence de *Koeneniodes madecassus* aux Seychelles n'est pas surprenante et constitue un nouveau jalon entre Sri Lanka, Madagascar et les Mascareignes. Récolté dans un vieux cimetière, il pourrait, une fois encore, être interprété comme un témoin de l'impact de l'Homme.

Le tableau 1 regroupe tous les documents actuellement disponibles, les accolades unissant des espèces très voisines.

	Madagascar	La Réunion	Maurice	Seychelles	Sri Lanka	Pondichéry	Népal	Hong Kong	Bornéo	Sulawesi	Java	Bali	Papouasie
E. florenciae	+	+	+				+						
K. frondiger et cf.	+	+	+							+	+	+	+
K. berndi									+				
K. madecassus	+	+	+	+	+			+			+		
E. chartoni	+				+								
E. angusta hindua						+							
tamula						+							
E. necessaria	+												

DESCRIPTION COMPLÉMENTAIRE DE *Koeneniodes madecassus*

Madagascar. Nosy Be, Hellville, au pied d'une borne-fontaine, 07.IX.1947, P. Remy leg.: femelle adulte holotype (REMY 1950:157)[1].

Seychelles. La Digue, «Anse La Réunion», vieux cimetière (B), 13.VII.1992, Ingrid Trembley leg.: femelle adulte. Berlese à Genève, à partir d'un très petit échantillon de sol prélevé à l'intention de B. Hauser.

Java. Sar-87/31. Femelle juvénile *B* (CONDÉ 1990:686).

Hong Kong. Bru-88/56. Femelle juvénile *B* (CONDÉ 1993:29).

LONGUEURS ET RAPPORTS

Le tableau 1 résume les longueurs et rapports de l'holotype et des trois autres spécimens cités.

Prosoma. - Bouclier avec 10 + 10 soies bien développées, surtout les latérales postérieures, disposées sur 5 rangées de 4, 2, 4, 6, 4 éléments. Au basitarse IV, *grt*

TABLEAU 1

L = longueur totale, B = bouclier prosomien, bta = basitarse IV, t/r = longueur du basitarse IV/longueur de la soie raide, t/er = longueur du basitarse IV / distance extrémité proximale du basitarse à embase de r, gla = soie grêle latérale antérieure, grt = soie grêle tergale.

	L (mm)	B (mm)	B/bta	bta (µm)	t/r	t/er	gla/grt
Femelle juv. Java	0,94	0,23	4	57,50	0,93	1,93-2	1
Femelle juv. Hong Kong	0,88	0,24	4,37	54,80	0,93	2,09	–
Femelle adulte Seychelles	0,68 (contractée)	0,25	3,31	75,50	0,96	2,12	0,97-1
Femelle holotype Madagascar	1,20	0,29	3,07	93	1,08	2,16	1,10

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[1] REMY n'a pas désigné de type, mais l'unique femelle adulte d'Hellville, 07.IX.47, décrite et figurée (1950:157, figs 12, 3 et 13), est conservée sur lame au Muséum national d'Histoire naturelle, Zoologie-Arthropodes. L'étiquette, de la main de Remy, porte: «*Koeneniodes borbonicus* ad. ♀ Helleville (sic) 115». Le nom de *borbonicus* est resté *in litt.*, remplacé par celui de *madecassus*; il avait été inspiré par une femelle adulte de Sainte-Rose (Ile de La Réunion), citée en bas de la page 157, dont REMY avait commencé l'examen et à laquelle il a emprunté les dessins 1, 2 et 4 – peu importants – de la fig. 12. A sec sous la lamelle, le spécimen a été traité sur place en injectant un peu d'eau distillée puis de glycérine. Il a été ainsi possible de l'examiner en détail et, par comparaison avec la fig. 13 de la description originale, d'affirmer qu'il s'agit bien du type de l'espèce, d'autant que Remy a respecté l'orientation des phanères dans la préparation.

s'insère un peu plus distalement que *r* et *gla*, les *esd* sont insérées en face de *r*, les *esp* manquent: 5 phanères au total.

Opisthosoma. - Premier volet génital de l'adulte des Seychelles avec 8 soies courtes à large embase sur la région moyenne (9 chez l'holotype, 10 chez le spécimen du Sri Lanka, 7 chez celui de Maurice). Une paire d'orifices glandulaires à la face interne du premier volet génital. Le 2^e volet avec des groupes latéraux antérieurs de 6-7 orifices glandulaires chacun.

Flagelle régénéré (Seychelles) de 0,18 mm, avec 4 articles tous dépourvus de verticille subapical d'épines. Le flagelle brisé d'une femelle adulte de La Réunion comprend 7 articles les 1, 2, 3, 5 et 7 avec un verticille d'épines (REMY 1952:75); le flagelle intact d'un immature *A* est formé de 7 articles tous dépourvus de verticilles d'épines (REMY, loc. cit.: 77).

MORPHOGENÈSE POSTEMBRYONNAIRE

L'examen de spécimens fixés dans l'alcool depuis une année au plus m'a permis d'observer, in toto, l'évolution des massifs glandulaires des segments opisthosomiens IV à VI, en relation avec celle des phanères décrite par REMY (1950, 1952).

Chez la femelle juvénile, le sternite IV est dépourvu de massif glandulaire sous la rangée de phanères (a_1, a_2, a_3), les a_1 et a_2, élargis distalement en forme de palette, ne présentant pas l'aspect de phanères excréteurs. En V et en VI, la rangée de phanères (a_1- a_3 ou 1 - 5) surmonte un massif glandulaire allongé transversalement, plus développé en V, tous les phanères concernés étant de type excréteur.

La femelle adulte acquiert, au bord antérieur du sternite IV, un groupe de 15 ou 16 phanères épais sur une protubérance en forme de dôme; à la rangée postérieure, déjà présente chez le juvénile, les phanères en palette (a_1, a_2) sont remplacés par des poils épais de type excréteur. En V, la rangée de phanères homologues de ceux du juvénile, possède des a_1 et a_2 en palette, les a_3 étant des poils épais de type excréteur; en outre, une paire parasagittale antérieure de poils *a*, plus grêles et deux fois plus courts que les a_3, et une rangée postérieure de 11 (8 à 13) poils un peu moins épais et plus longs que les *a*. Une énorme masse glandulaire occupe les segments IV et V, débordant un peu en III; ses échancrures latérales correspondent, grosso modo, aux limites segmentaires. Ce massif n'atteint cependant pas la rangée postérieure du sternite V dont les phanères, recourbés vers l'avant, ressemblent pourtant à des excréteurs relativement grêles. Le sternite VI est sans changement, sauf la seconde paire de soies latérales grêles (s_2), présente aussi aux sternites IV et V.

Outre le développement considérable du matériel glandulaire en IV et V, on retiendra l'échange des phanères en palette entre le sternite IV du juvénile et V de l'adulte.

REMY (1960a:65 note en pied) écrivait: «La répartition que j'ai donnée des phanères sternaux... de *K. madecassus* (REMY 1950) est des plus douteuse...» Mes observations démontrent au contraire l'exactitude de la distribution des phanères figurée et minutieusement décrite par P. REMY qui fut le trop modeste rénovateur de la systématique des Palpigrades.

CONCLUSION

Au cours des cinquante dernières années, notre connaissance des Palpigrades a connu de substantiels progrès grâce aux récoltes faites dans la région madécasse, puis en Asie tropicale où le groupe est particulièrement bien représenté. Les Missions du Muséum d'Histoire naturelle de Genève (Hong Kong, Bornéo, Java, Bali) et les correspondants de cette Institution ont largement contribué à rassembler les matériaux qui, outre leur intérêt biogéographique, ont été à l'origine de nombreuses acquisitions sur la systématique, la morphologie, le dimorphisme sexuel, la sex-ratio (femelles prédominantes ou exclusives) et les stades du développement postembryonnaire, ouvertures sur la biologie du groupe qui nous est encore pratiquement inconnue, les observations dans la nature étant impossibles et les élevages limités jusqu'ici à quelques semaines (CONDÉ 1996).

Une meilleure connaissance des Palpigrades des îles de l'Océan Indien permettra sans doute de préciser certaines modalités de leur peuplement, mais il sera toujours difficile d'évaluer l'impact de l'Homme dont les activités ont constitué de longue date un facteur biogéographique non négligeable. La «route» des Palpigrades et de beaucoup d'autres endogés suit d'ailleurs celle des colons malais dont les premiers ont atteint Madagascar autour de l'an 0 de notre ère. Plusieurs vagues ont suivi, la dernière entre les X^{e} et XII^{e} siècles. Les nouveaux arrivants ont chaque fois soumis et chassé leurs précurseurs vers les hauts plateaux de l'intérieur, créant ainsi une grande diversité de peuples et de royaumes.

Enfin, nommer une espèce d'après le lieu géographique de sa découverte (*borbonicus* puis *madecassus*, dans le cas présent) peut, un jour, s'avérer trop restrictif.

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REVUE SUISSE DE ZOOLOGIE 104 (2): 379-467; juin 1997

Shallow waters Demosponges of the Galápagos Islands

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Shallow waters Demosponges of the Galápagos Islands. - Descriptions and illustrations are presented for 45 sponge species from shallow waters of the Galápagos Islands, obtained from collections made by the South East Pacific Biological Oceanographic Programme (SEPBOP) 1966 and W.D. Hope in 1978 deposited in the National Museum of Natural History, Washington. Twenty two previously known species are described, most new record for this area, one a new combination: *Higginsia papillosa* Thiele, transfered to *Halicnemia*. Twenty three species of the genera *Plakina*, *Plakortis*, *Penares*, *Stelletta*, *Dercitus*, *Corallistes*, *Cinachyrella*, *Chondrilla*, *Sigmosceptrella*, *Polymastia*, *Quasillina*, *Tethya*, *Phakellia*, *Halicnemia*, *Spongosorites*, *Aulospongus*, *Lissodendoryx*, *Oceanapia*, and *Cacospongia*, are new to science.
Definitions of genera and families are briefly discussed. Comparisons made with many type specimens of species from the NE, Central and SE Pacific areas.

Key-words: Demosponges - Galápagos - Fauna - Systematics.

INTRODUCTION

Knowledge of the shallow water sponge fauna of the Galápagos Islands (Table 1) is limited to a few records made by DE LAUBENFELS (1939) based on material collected during a 1938 cruise of President Franklin D. Roosevelt in the tropical East Pacific, and on material collected during the Hancock Pacific Expedition on the M.S. Velero III: DESQUEYROUX-FAÚNDEZ & VAN SOEST (1996), who described *Tedania (Tedania) galapagensis* and recorded two other species, and TOPSENT (1895) who reported *Chondrosia reniformis* Nardo, 1847 from the Galápagos Islands.

Deep-water sponges were collected by the U.S. Fish Commission Steamer "Albatross" during 1891 and described by WILSON (1904).

Thus, with about 30 species known prior to the present study this area remains one of the least known areas of world for sponges.

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TABLE 1

Galápagos species previously recorded. Information from literature.

Topsent, 1895	Wilson, 1904	De Laubenfels, 1939	Desqueyroux-Faúndez & van Soest, 1996
Chondrosia reniformis Nardo, 1847	*Euplectella* sp.	*Haliclona enamela* De Laubenfels, 1930	*Iophon lamella* Wilson, 1904
	Regradella delicata Wilson, 1904	*Haliclona permollis* (Bowerbank, 1866)	*Myxilla (M.) mexicensis* Dickinson, 1945
	Hexactinella ventilabrum Carter, 1885	*Adocia simulans* (Johnston, 1842)	*Tedania (T.) galapagensis* Desqueyroux-Faúndez & van Soest, 1996
	H. labyrinthica Wilson, 1904	*Callyspongia vaginalis* (Lamarck, 1814)	
	H. tubulosa Schulze, 1887	*Merramium roosevelti* (De Laubenfels, 1939	
	Sclerothamnopsis compressa Wilson, 1904	*Tedania nigrescens* (Schmidt, 1862)	
	Penares foliaformis Wilson, 1904	*Higginsia papillosa* Thiele, 1905	
	Thenea fenestrata Schmidt, 1875	*Cliona celata* Grant, 1826	
	Poecillastra cribraria Wilson, 1904	*Geodia paupera* Bowerbank, 1873	
	P. tricornis Wilson, 1904		
	Polymastia maeandria Wilson, 1904		
	Auletta dendrophora Wilson, 1904		
	Iophon lamella Wilson, 1904		
	I. lamella indivisus Wilson, 1904		
	I. indentatus Wilson, 1904		
	Tylodesma alba Wilson, 1904		
	T. vestibularis Wilson, 1904		
	Oceanapia bacillifera Wilson, 1904		
	Petrosia variabilis crassa Wilson, 1904		
	P.similis densissima Wilson, 1904		

MATERIAL AND METHODS

Specimens were collected at the Galápagos Islands, including Albemarle Isl. (I. Isabela), Indefatigable Isl. (I. Santa Cruz), Gardner Isl., (I. Española), James Isl. (I. Santiago), Bindloe Isl. (I. Marchena), Nameless Isl. (I. Sin Nombre), and Seymour Isl. (I. Seymour).

The holotypes of this collection are deposited in the USNM. Several paratypes, as well as schizo-holotypes of new species (fragments and microscopic slides of type material), are deposited in ZMA and in the MHNG. Representative specimens and/or fragments of known species are deposited in each of the three museum collections.

Specimen data are indicated with each species description under "Material", in the following order:

Specimens or fragments deposited at USNM with their registration number, SEPBOP "Anton Bruun" Cruise number, locality, geographical coordinates, date (day, month, year), depth in m, type of substrate, fragments and microscopical slides deposited at ZMA and MHNG with their registration number.

Type material of studied species and related genera was borrowed from different museums for comparisons. Data are indicated.

Abbreviations cited in text are:

BMNH:	Natural History Museum, London
MHNG:	Muséum d'histoire naturelle, Genève
MNHN:	Muséum national d'histoire naturelle, Paris
LMJG:	Landes Museum Jubileum, Graz
USC:	University of Southern California
SEPBOP:	South Eastern Pacific Biological Oceanographic Program
USNM/NMNH:	National Museum of Natural History, Washington
ZMA:	Zoölogisch Museum Amsterdam
ZMB:	Museum für Naturkunde der Humboldt Universität, Berlin

Skeletal slides and dissociated spicule mounts were prepared following RÜTZLER (1978). The SEM study was made at MHNG, using a Zeiss Digital Scan Microscope DSM-940, with accelerating voltage of 20 kV and magnification up to 10000 times. Spicule measurements are given as minimum - *mean* - maximum, N = 25.

SYSTEMATICS

Order HOMOSCLEROPHORIDA
Plakinidae Schulze, 1880
Genus *Plakina* Schulze, 1880
    Plakina fragilis n. sp.
    Plakina microlobata n. sp.
    Plakina pacifica n. sp.
Genus *Plakortis* Schulze, 1880
    Plakortis galapagensis n. sp.

Order ASTROPHORIDA
Ancorinidae Schmidt, 1870
Genus *Penares* Gray, 1867
    Penares saccharis (De Laubenfels, 1930)
    Penares apicospinatus n. sp.
    Penares scabiosus n. sp.
Genus *Stelletta* Schmidt, 1862
    Stelletta eduardoi n. sp.
Pachastrellidae Carter, 1875
Genus *Dercitus* Gray, 1867
    Dercitus reptans n. sp.
Genus *Poecillastra* Sollas, 1888
    Poecillastra cribraria Wilson, 1904
Genus *Vulcanella* Sollas, 1886
    Vulcanella tricornis (Wilson, 1904)
Geodiidae Gray, 1867
Genus *Geodia* Lamarck, 1815
    Geodia media Bowerbank, 1873
Genus *Erylus* Gray, 1867
    Erylus cf. *oxyaster* von Lendenfeld, 1910
Order LITHISTIDA
Corallistidae Sollas, 1888
Genus *Corallistes* Schmidt, 1870
    Corallistes isabela n. sp.
Order: SPIROPHORIDA
Tetillidae Sollas, 1886
Genus *Cinachyrella* Wilson, 1925
    Cinachyrella globulosa n. sp.
Order: HADROMERIDA
Clionidae Gray, 1867
Genus *Cliona* Grant, 1826
    Cliona chilensis Thiele, 1905
Chondrillidae Schmidt, 1862
Genus *Chondrilla* Schmidt, 1862
    Chondrilla verrucosa n. sp.
Genus *Chondrosia* Nardo, 1842
    Chondrosia cf. *chucalla* de Laubenfels, 1954
Latrunculiidae Topsent, 1922
Genus *Sigmosceptrella* Dendy, 1922
    Sigmosceptrella hospitalis n. sp.
Polymastiidae Gray, 1867
Genus *Polymastia* Bowerbank, 1863
    Polymastia villosa n. sp.

Genus Quasillina Norman, 1868
    Quasillina translucida n. sp.
Tethyidae Gray, 1867
Genus *Tethya* Lamarck, 1814
    Tethya sarai n. sp.
Order HALICHONDRIDA
Axinellidae Carter, 1875
Genus *Auletta* Schmidt, 1870
    Auletta dendrophora Wilson, 1904
Genus *Phakellia* Bowerbank, 1863
    Phakellia hooperi n. sp.
Desmoxyidae Hallmann, 1917
Genus *Halicnemia* Bowerbank, 1864
    Halicnemia diazae n. sp.
Halichondriidae
Genus *Hymeniacidon* Bowerbank, 1861
    Hymeniacidon sinapium De Laubenfels, 1930
Genus *Spongosorites* Topsent, 1896
    Spongosorites smithae n. sp.
Genus *Topsentia* Berg, 1899
    Topsentia aff. *ophiraphidites* (De Laubenfels, 1934)
Order POECILOSCLERIDA
Suborder MICROCIONINA
Iophonidae Burton, 1929
    Iophon lamella Wilson, 1904
Genus *Acarnus* Gray, 1867
    Acarnus peruanus van Soest, Hooper & Hiemstra, 1991
Microcionidae Carter, 1875
Genus *Antho* Gray, 1867
Subgenus *Plocamia* Schmidt, 1870
    Antho (Plocamia) lithophoenix (De Laubenfels, 1927)
Raspailiidae Hentschel, 1923
Genus *Aulospongus* Norman, 1878
    Aulospongus galapagensis n. sp.
Suborder MYXILLINA
Myxillidae Topsent, 1928
Genus *Myxilla* Schmidt, 1862
Subgenus *Myxilla* Schmidt, 1862
    Myxilla mexicensis Dickinson, 1945
Tedaniidae Ridley & Dendy, 1886
Genus *Tedania* Gray, 1867
Subgenus Tedania Gray, 1867
    Tedania (Tedania) galapagensis Desqueyroux-Faúndez & van Soest, 1996

Anchinoidae Topsent, 1928
Genus *Phorbas* Duchassaing & Michelotti, 1868
    Phorbas californiana (De Laubenfels, 1932)
Coelosphaeridae Hentschel, 1923
Genus *Lissodendoryx* Topsent, 1892
    Lissodendoryx albemarlensis n. sp.
Suborder MYCALINA
Guitarridae Burton, 1929
Genus *Guitarra* Carter, 1874
    Guitarra abbotti Lee, 1987
Mycalidae Lundbeck, 1905
Genus *Mycale* Gray, 1867
Subgenus *Carmia* Gray, 1867
    Mycale (Carmia) cecilia De Laubenfels, 1936
Order HAPLOSCLERIDA
*Chalinidae
Phloeodictyidae Carter, 1882
Genus *Oceanapia* Norman, 1869
    Oceanapia microtoxa n. sp.
Order DICTYOCERATIDA
Irciniidae Gray, 1867
Genus *Ircinia* Nardo, 1833
Ircinia sp.
Genus *Cacospongia* Schmidt, 1862
    Cacospongia similis Thiele, 1905
    Cacospongia incognita n. sp.
Order DENDROCERATIDA
Dysideidae Gray, 1867
Genus *Spongionella* Bowerbank, 1862
    Spongionella repens (Thiele, 1905)
Order VERONGIDA
Aplysinidae Carter, 1875
Genus *Aplysina* Nardo, 1834
    Aplysina azteca Gomez & Bakus, 1992

*We mention here the occurrence of several species of *Haliclona* (Haplosclerida, Chalinidae) in our samples, but these are not included in the descriptions below because the state of preservation of this material was insufficient for making recognizable descriptions.

DESCRIPTIONS

Order HOMOSCLEROPHORIDA
Plakinidae Schulze, 1880

Plakina Schulze, 1880

Type species: *Plakina monolopha* Schulze, 1880 by subsequent designation (SOLLAS, 1888).

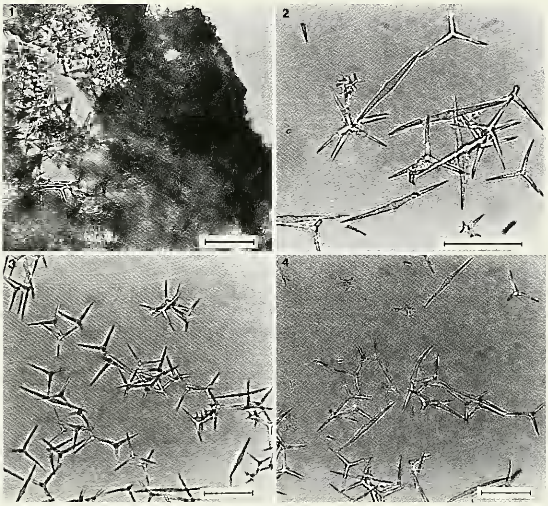
Definition (from DIAZ & VAN SOEST, 1994): thinly to massively encrusting Plakinidae with a spiculation of diods, triods and calthrops, and with lophocalthrops with one, two, three or four lophate rays. The lophocalthrops are concentrated at the sponge surface. Eurypylous choanocyte chambers usually with a radial arrangement of chambers around a central excurrent canal.

Plakina fragilis n. sp. (Figs 1-4)

Material: Holotype USNM 43168 SEPBOP "Anton Bruun" 18B-794A James Isl., 00°12'S 90°50'W, 23-09-1966, intertidal. Microscopical slides and fragments ZMA POR. 11190, MHNG 21531.

DESCRIPTION:

Thin crust of 0.3 mm in thickness and about 5 mm^2 in lateral expansion. Surface: no apparent oscules or larger openings; microscopically there is a regular distribution of inhalant and exhalant pits. Consistency fragile, cheesy.



FIGS 1-4

Plakina fragilis n. sp. 1. Holotype, encrusting specimen. Stat. 18B 794A James Isl., longitudinal view of surface skeleton, trilophate spicules on surface. 2, 3, 4. General view of spicules: diods, triods calthropses and trilophose calthrops or lophocalthrops. Scales: figs 1-4= 50 µm.

SKELETON:

Ectosomal: not differentiated clearly from the choanosome, but trilophate spicules are concentrated at the surface.

Choanosomal: regularly alveolar with alveolae of 40-60 µm in diameter, covered by calthrops and diods.

Spicules: diods, triods, calthrops and trilophose calthrops.

Diods: irregular, curved, markedly thicker in the middle, 66 - *83.4* - 96 µm by 4.5 - *5.45* - 7.0 µm.

Triods: rare, occasionally Y-shaped, cladome 42 - *50.0* - 61 µm, longest ray 24 - *29.2* - 36 µm by 3.0 - *3.25* - 4.0 µm.

Calthrops: very frequently (40 %) with one ray reduced to a short knob, often (30%) with a second ray also reduced to a knob, cladome 29 - *43.8* - 56 µm, longest ray 18 - *25.7* - 33 µm by 2.5 - *3.1* - 4.0 µm.

Trilophose calthrops: with each lophate ray trifurcate, a good proportion with the fourth non-lophate ray bifurcate, occasionally the divided rays show also incipient lophate development, thus verging towards being "tetralophate", cladome 18 - *21.2* - 25 µm, non-lophate ray 12 - *13.5* -15 by 2.0 - *3.0* - 4.0 µm.

Etymology: the name refers to its consistency.

Remarks: the present species belongs to the world-wide species complex referred to *Plakina trilopha* Schulze, 1880, but clearly consisting of several distinct sibling species. Other species included in this complex are *P. corticioides* Vacelet, Vasseur & Lévi, 1976, and *P. tetralopha* Hoshino & Tanita, 1989. The differences between allopatric species in this cosmopolitan species complex are very small and subtle (cf. Table 2). The Galápagos *P. fragilis* n. sp. differs from the Mediterranean *P. trilopha* in the more robust spicules and the relative more common calthrops (rare in *P. trilopha*), but especially in the high frequency of the doubly reduced calthrops (which it shares only with *P. trilopha* sensu VACELET, VASSEUR & LÉVI 1976 from Madagascar). It is uncertain whether the Galápagos specimen and the specimen reported as *P. trilopha* from Chile (23°S) by DESQUEYROUX (1972) belong to the same species; the cladome of the trilophose calthrops is clearly larger (27-37 µm) in Chilean material, which is shared with Subantarctic and Antarctic specimens of *P. trilopha* (sensu KOLTUN 1964; BOURY-ESNAULT & VAN BEVEREN 1982), none of which are strictly conspecific with the Mediterranean population of *P. trilopha* (MURICY *et al.*, in press).

Plakina microlobata n. sp. (Figs 5-10)

Material: Holotype USNM 40632 SEPBOP "Anton Bruun" 18B-794A James Isl., 00°12'S 90°50'W, 23-09-1966, intertidal. Microscopical slides and fragments, MHNG 18980.

Paratype: ZMA.POR. 11207, SEPBOP "Anton Bruun" 16-66139 Albemarle Isl., N coast, 00°15'55"S 91°26'41"W, 25-05-1966, 0-3 m.

DESCRIPTION:

Thinly encrusting on rock (holotype, together with *Erylus* cf. *oxyaster* and serpulids), 10-20 mm^2 in lateral expansion, 1-3 mm in thickness. Smooth surface, strongly undulating, micro-lobate and pitted regularly (visible to the naked eye).

TABLE 2

Spicule sizes reported for *Plakina trilopha* Schulze, compared to Plakina fragilis n. sp., information from literature, various localities and ZMA and MHNG material. Measurements (in µm) refer to length and width (diods), to cladome and length and width of rays (triods, calthropses and lophose calthrops).

Author/collect.	Locality	Diods	Triods	Calthrops	Lophocaltrops
P. trilopha	Mediterranean	present	present	present	present
Topsent, 1895	Mediterranean	present	present	present	rays 15-25
Koltun, 1964	Antarctica	70-147 x 3-5	clad. 25-57	clad.25-57	clad. 25-44
Bergquist, 1968	New Zealand	62-72 x 5-5.5	clad. 48-58	rays 24-29 x 4-6	clad. 20-28
Thomas, 1970	India	63-105 x 2-6	rays 29 x 4	rays 29 x 4	clad. 21-25
Boury-Esnault, 1973	Brazil	present	present	clad. 53	clad. 22
Vacelet *et al.*, 1976	Madagascar	80-100 x 2.5-4	absent	rays 20-25	rays 7.5-10
Boury-Esnault & van Beveren, 1982	Kerguelen	81-127 x 2.5-5	rays 31-52	rays 31-52	clad. 26-39
Pulitzer-Finali, 1983	Mediterranean	80	?	rays 30	clad. 16-21
Lévi & Lévi, 1989	Philippines	80-100 x 5	rays 25-40 x 2-4	clad. 25 rays 15 7-10	
Diaz & van Soest, 1994 ZMA POR 10331 ZMA POR 10332	Mediterranean	78-103 x 2-3	rays 36 x 2.5	rays 30 x 1.5	clad. 18
P. fragilis n. sp. ZMA POR 11190 MHNG 21531	Galápagos	66-96 x 5-7	clad. 42-61 rays 29.2 x 3.25	clad. 29-56 rays 25.7 x 3.1	clad. 18-25 rays 13.5 x 3.0

Consistency: firm, cheesy.

Colour: whitish beige in alcohol.

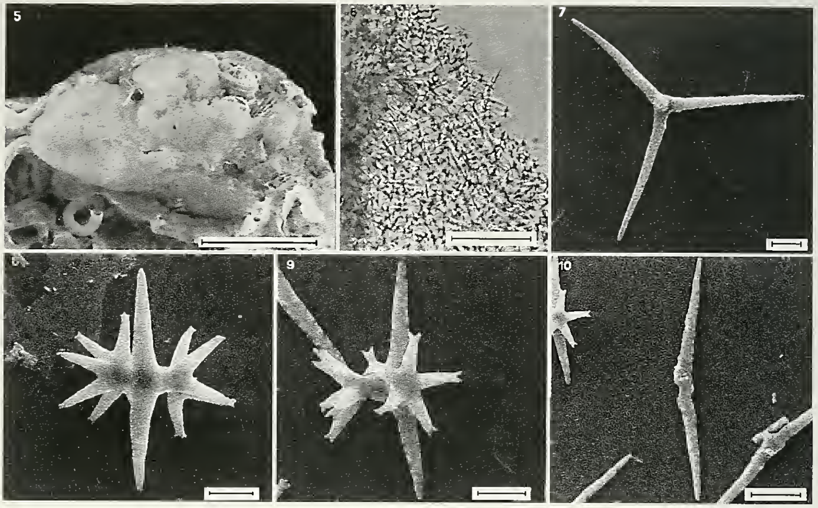
SKELETON:

Ectosomal: not clearly differentiated from the choanosome. Inhalant pits rounded, 120-150 µm in diameter, exhalant pits elongate, irregular, 350-400 µm by 100 µm.

Choanosomal: markedly alveolar, with individual alveolae and inhalant and exhalant pits clearly visible in thick sections. Alveolae (which are presumably the choanocyte chambers surrounded by a coat of spicules) are 50 µm in diameter, perfectly round.

Spicules: diods, triods, calthrops and dilophose calthrops.

Diods, common, occasionally provided with an incipient middle ray which may be vestigially lophate, small, of rather uniform size, 45 - *60.5* - 72 µm by 1.5 - *2.75* - 4.0 µm.



FIGS 5-10

Plakina microlobata n. sp. 5. Holotype, thinly encrusting specimen. Stat. 18B 794A James Isl. 6. Skeletal structure, longitudinal view. 7. Calthrops with normal rays. 8, 9. Dilophose calthrops with 2 lophate rays and bifurcate non lophate ray. 10. Diods with incipient middle ray. Scales: fig. 5 = 10 mm; fig. 6 = 50 µm; figs 7-9 = 5 µm; fig. 10 = 10 µm.

Triods, rare, often Y-shaped, cladome 33 - *38.6* - 51 µm, longest ray 21.0 - *24.0* - 28 µm by 2.0 - *2.25* - 3.0 µm.

Calthrops, the majority with one of the rays reduced to a stub, cladome 24 - *32.5* - 40 µm, longest ray 15 - *20.3* - 26 by 1.5 - *2.05* - 2.5 µm.

Dilophose calthrops, mostly with two lophate rays, occasionally one of the non-lophate rays is bifurcate, cladome 16 - *21.5* - 27 µm, longest ray 9 - *11.2* - 13 µm by 1.0 - *1.75* - 2.5 µm.

Etymology: the name refers to characters of the surface.

Remarks: Plakina species with dilophotriaenes (Table 3) have been reported from the Mediterranean (*Plakina dilopha* Schulze, 1880; TOPSENT 1895), from the Caribbean (*Plakina elisa* (De Laubenfels 1936) as *Plakoosa*; (refered to *P. dilopha* by TOPSENT (1937)), and from Ascension (DIAZ & VAN SOEST 1994 as *Plakina* cf. *dilopha*). The new species differs from the Mediterranean *P. dilopha* in spicule sizes (shorter diods, shorter-rayed triods) and diversity of lophotriaenes (absence of monolophotriaenes in the present specimens). SCHULZE (1880) mentions the rarity of calthropses, TOPSENT (1895) the rarity of diods, while in the specimens at hand, both are common. In contrast, the triods are rare. The new species differs from *P. elisa*, in possessing common calthrops (not found in *elisa*); moreover, specimens conforming to *P. elisa* from Curaçao have a large proportion of the diods and triods provided with several sharp spines. Of the compared specimens (cf. Table 3) the material from Ascension is closest to the present species, differing in the more robust spicules and the rarity of calthropses.

The fact that this species was collected from the same locality as the preceeding one requires some comment on their discrimination. Apart from the obvious difference in the presence of trilophose calthrops in *P. fragilis* that are absent in *P. microlobata*, the length and thickness of both diods and calthrops are subtly but clearly smaller in the present species. The diods of *P. microlobata* are invariably irregularly roughened or spined in the middle whereas those of *P. fragilis* are smooth.

A species possibly related to the present one is *Plakina bioxea* Green & Bakus, 1994 from deep water off Santa Maria Basin, California. The spicule types mentioned by these authors match those of our new species, be it that diods reach a larger size and have 2-8 central spines. A major difference, however, is the alleged presence of long oxeas 300-1120 µm long, arranged in thick bundles of 50 spicules diameter. It is conceivable that these are not proper to the species, as spicule bundles are not known in Plakinidae so far.

TABLE 3

Spicule sizes reported for *Plakina dilopha* Schulze and *Plakina elisa* De Laubenfels, compared to *Plakina microlobata* n. sp., information from literature and ZMA and MHNG material. Measurements (in µm) refer to length and width (diods), to cladome (triods calthrops and lophocalthrops) and length and width of rays (triods, calthrops and lophocalthrops).

Author/collect.	Locality	Diods	Triods	Calthrops	Lophocalthrops
P. dilopha	Mediterranean	70-90	rays 25-30	rays 25-30	rays 25-30
P. cf. *dilopha* Diaz & van Soest, 1994 ZMA POR 10330 ZMA POR 10333	Ascension	80-90 x 3	rays 15-26	Absent?	rays 13 x 2
P. elisa	Panama (Car.)	present	rays 25 x 2	Absent?	rays 12 x 1
Diaz & van Soest, 1994 ZMA POR 8429 ZMA POR 10229	Curaçao	80 x 4	rays 18-23 x 4	rays 18-24 x 4	rays 16 x 3
P. bioxea	California	78-179 x 3-8	?	rays 29-39 x 4.5 13-19 x 4-5	?
P. microlobata n. sp. ZMA POR 11207 MHNG 18980	Galápagos	60.5 x 2	clad. 38.6 rays 24 x 2.2	clad. 24-40 rays 20.3 x 2.0	clad. 16-27 rays 11 x 1.7

Plakina pacifica n.sp. (Figs 11-16)

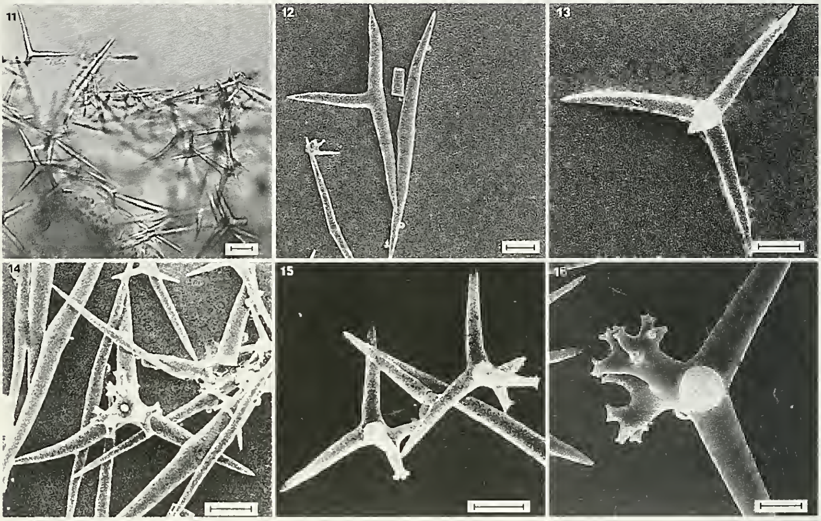
Material: Holotype USNM 41440 SEPBOP "Anton Bruun" 16-66139 Albemarle Isl., N coast, 00°15'S 91°26'W, 25-05-1966, 0-3 m. Microscopical slides and fragments ZMA POR. 11208, MHNG 18982.

DESCRIPTION:

Three small, thin crusts of 5-8 mm^2 and 0.5-1.0 mm in thickness. Surface somewhat undulating, microlobate, optically smooth but with microscopical pits (which are characteristic for the genus).

Consistency: cheesy.

Colour: beige, in alcohol.



FIGS 11-16

Plakina pacifica n. sp. Holotype, Stat. 16-66139 Albemarle Isl. 11. Ectosomal skeleton with larger lophotriaenes outward. 12. Asymmetrical triods, Y shaped and diods. 13, 14. Calthrops with three knobbed rays and an incipient lophate ray. 15, 16. Transitional monolophose calthrops with knobbed and lophate ray divided in two or three cladi. Scales: fig. 11 = 50 µm ; figs 12-14 = 20 µm ; fig. 15, 16 = 10 µm.

SKELETON:

Ectosomal: strengthened by a crust of larger lophose calthrops, with the lophate ray directed outward.

Choanosomal: uniformly distributed predominantly tetractine spicules; alveolate structure obscured. At the base of the sponge there are extensive lacunae, with a basal crust of small lophose calthrops.

Spicules: diods, triods, calthrops and two categories of monolophose calthrops.

Diods: very common, sometimes with incipient third ray protruding from the middle at right angles, with large size variation (possibly in two discrete categories): 67 - *160.7* - 184 µm by 4.0 - *8.8* - 12 µm.

Triods: relatively rare, many asymmetrical or Y-shaped, cladome 61 - *92.5* - 131 µm, longest ray 47 - *58.2* - 77 µm by 4.0 - *5.6* - 9.0 µm.

Calthrops: common, occasionally with an incipient lophate ray, occasionally with 5 rays, with large size variation (possibly in two size categories) cladome 64 - *80* - 118 µm, longest ray 30 - *50.2* - 82 µm by 4.0 - *7.6* - 13 µm.

Monolophose calthrops, clearly in two sizes which are also partly localized (cf. above), with lophate ray divided in two or three cladi which proliferate in the larger spicules, 1) cladome 26 - *29.1* - 32 µm, longest ray 13 - *15.2* - 19 µm by 1.0 - *1.7* - 3.0 µm, 2) cladome 46 - *74.1* - 103 µm, longest ray 19 - *45.1* - 60 by 4 - *7.6* - 12 µm.

Etymology: named after its origin, the Pacific Ocean.

Remarks: the new species belongs to the *P. monolopha* species complex distributed over most areas of the world. Although it is certain that all specimens reported under the name *Plakina monolopha* Schulze from such disjunct localities as the Mediterranean, the Caribbean, the Indian Ocean, Hawaii and Antarctica belong to the same species, it is likely that they form a complex of closely related species sharing the lophose calthrops with a single lophate ray. Among these, the new species stands out in possessing two distinct non-overlapping size categories of lophose calthrops, the larger of which is concentrated at the surface. Literature data on *P. monolopha* spicules sizes and categories are presented in Table 4, and from these it can be deduced that the new species has clearly larger diods than most recorded specimens, and that also the size of the calthrops is comparatively large.

Plakortis Schulze, 1880

Type species: *Plakortis simplex* Schulze, 1880 by subsequent designation (SOLLAS 1888).

Definition (from DIAZ & VAN SOEST 1994): thinly to massively encrusting Plakinidae with a spiculation of small (50-200 µm) diods and with triods in varying abundance. Deformed calthrops and diod-derived "microscleres" (5-20 µm) are found occasionally distributed regularly in the sponge body.

Plakortis galapagensis n.sp. (Figs 17-20)

Material: Holotype USNM 41443 SEPBOP "Anton Bruun" 16-66139 Albemarle Isl., N coast, 00°15'S 91°26' W, 25-05-1966, 0-3 m. Microscopical slides and fragments ZMA POR11209, MHNG 18994.

DESCRIPTION:

A fragment of a massive encrustation, 5 mm in thickness. Surface smooth, with a few openings.

Consistency: soft.

Colour: beige in alcohol.

TABLE 4

Spicule sizes reported for *Plakina monolopha* Schulze compared to *Plakina pacifica* n. sp., information from literature and ZMA and MHNG material. Measurements (in µm) refer to length and width (diods), to cladome (triods calthrops and lophocalthrops) and to length and width of rays (triods, calthrops and lophocalthrops.

Author/collect.	Locality	Diods	Triods	Calthrops	Lophocalthrops
P. monolopha	Mediterranean	70-90	rays 25-30	rays 25-30	rays 25-30
Thiele, 1898	Japan	80	20	absent	rays 10-15
Arndt, 1927	Curaçao (Car.)	75-90 x 3	rays 33 x 3	absent	rays 16
De Laubenfels, 1951	Hawaii	36 x 4	rays 20-24 x 3-4	rays 20-24 x 3-4	rays 12 x 3
Koltun, 1964	Antarctica	70-140 x 3-5	rays 20-52	rays 20-52	rays 10-20
Bergquist, 1968	New Zealand	72-96 x 4	rays 20-28 x 4	rays 20-28 x 4	rays 11-13 x 2
Thomas, 1970	India	63-109 x 2-6	rays 21-42 x 2-5	rays 21-42 x 2-5	rays 16
Pulitzer-Finali, 1983	Mediterranean	94	rays 32	rays 32	clad. 27-40
Hoshino & Tanita, 1989	Japan	85-120 x 4-6	rays 20-24 x 3-4	rays 20-24 x 3-4	clad. 20
Diaz & van Soest, 1994	Ireland	80-90 x 3-5	rays 30 x 3	rays 21 x 3	clad. 23
ZMA POR 4424					
P. pacifica n.sp. ZMA POR 11208 MHNG 18982	Galápagos	67-184 x 4-12	clad. 61-131 rays 47-77 x 5.6	clad. 64-118 rays 50.2 x 7.6	clad. 29.1 rays 15.2 x 1.7 clad. 74.1 rays 45.1 x 7.6

SKELETON:

Ectosomal: crust of tangential diods.

Choanosomal: alveolar structure well developed, alveolae 40-50 µm in diameter. Several embryos in advanced state of development are present, the largest of which measured 260 by 180 µm.

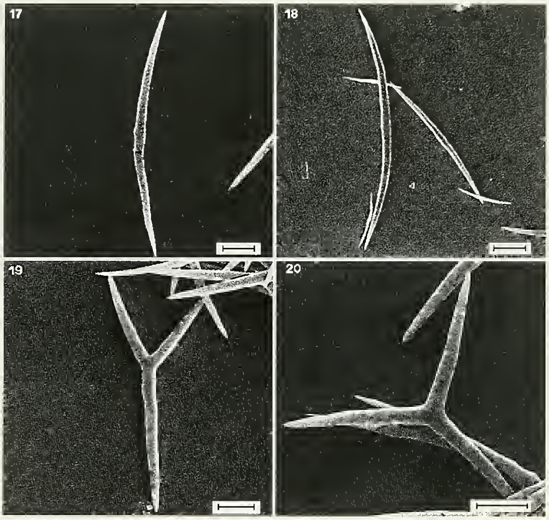
Spicules: diods and triods.

Diods: strongly, but irregularly curved, very variable in size, and at least two distinct size classes are recognizable (although intermediate sizes are also present in low quantities: 1) 126 - *142.3* - 165 µm by 4.0 - *6.1* - 8.0 µm, 2) 27 - *65.7* - 92 µm by 1.5 - *3.1* - 4.0 µm.

Triods: predominantly equal-angled, cladome 27 - *45.7* - 65 µm, longest ray 17 - *28.5* - 36 µm by 1.5 - *3.05* - 4.0 µm.

Etymology: named after its origin.

Remarks: this species belongs to the *Plakortis simplex* complex occurring in most areas of the world. This complex was recently discussed by DIAZ & VAN SOEST (1994), who concluded that subtle differences exist among allopatric populations



FIGS 17-20

Plakortis galapagensis n. sp. Holotype, Stat. 16-66139, Albemarle Isl. 17, 18. Different sizes of strongly curved diods. 19, 20. Y shaped and equal angled triods. Scales: fig. 17 = 20 μm; figs 18-20 = 10 μm.

answering generally to the description of *Plakortis simplex* and the likehood that most or all of these regional populations represent distinct sibling species. The present material differs from the Mediterranean populations clearly in the upper size of the diods. The apparent size categories of diods in the present material is a unique but dubious character separating this species from all other *Plakortis* (Table 5). It is unclear, whether species recorded with similar size ranges (*P. zyggompha* (De Laubenfels, 1934), *P. copiosa* Pulitzer-Finali, 1993, *P. kenyensis* Pulitzer-Finali, 1993, *P. quasiamphiaster* Díaz & van Soest, 1994) do in fact have two distinct size categories. Table 5 includes skeletal measurements of *Plakortis* species with large size diods: *P. angulospiculatus* (Carter, 1879), *P. erythraena* Lévi, 1958, *P. halichondrioides* (Wilson, 1902), *P. lita* De Laubenfels, 1954, *P. nigra* Lévi, 1953, *P. simplex* Schulze, 1880.

Order ASTROPHORIDA
Ancorinidae Schmidt, 1870

Penares Gray, 1867

Type species: *Stelletta helleri* Schmidt, 1864 by monotypy.

Definition (emended from TOPSENT 1894): Ancorinidae with a spiculation of microrhabds abundantly distributed in the cortex and in the external part of choanosome.

TABLE 5

Spicule size categories separating *Plakortis galapagensis* n. sp. from other species of *Plakortis* reported with similar size ranges of diods and triods: *P. zyggompha* (De Laubenfels), *P. copiosa* and *P. kenyensis* Pulitzer-Finali, *P. quasiamphiaster* Diaz & van Soest, *P. angulospiculatus* (Carter), *P. erythraena* Lévi. Information from literature and ZMA and MHNG material. Measurements (in µm) refer to length and width (diods), to cladome and to length and width of rays (triods), to average size and number of spines (amphiaster-like).

Author/collect.	Locality	Diods	Triods ray-length	Amphiaster-like
Plakortis zyggompha	Puerto Rico	50-140 x 2-5	25-50 x 2-3	——
P. copiosa	E. Africa	55-110	18-37 x 4-4.5	——
P. kenyensis	E. Africa	80-260 x 2-7	30-60	——
P. quasiamphiaster	Caraibe	66-136 x 4-6	14-47 x 3-5	27-75 x 3-6 spines 2-15
P. angulospiculatus BMNH 1850:5:8:35-37	Jamaica	60-120 x 3	none	——
P. erythraena	Red Sea	10-90 x 1-2	20-25 x 1-2	
P. halichondrioides	Virgin Isl.	130-200 x 3-5	rare	——
P. lita	Caroline Isl.	20-80 x 2-3	rare	5-8 x <1
P. nigra	Red Sea	20-90	——	——
P. simplex NMNH 8433, 9433	Mediterranean Atlantic?	60-150 x 3-6	25-50 x 3-6	——
P. galapagensis n. sp. ZMA POR 11209 MHNG 18994	Galápagos	126-165 x 4-8 27-92 x 1.5-4	clad. 27-65 rays 17-36 x 1.5-4	——

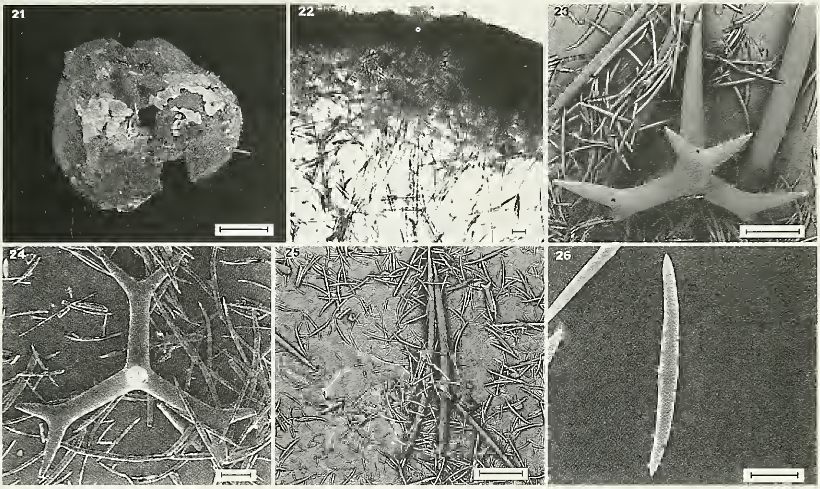
Penares saccharis (De Laubenfels, 1930) (Figs 21-26)

Papyrula saccharis De Laubenfels, 1930: 26, 1932: 37, fig. 16.

Material: USNM 37916 Gardner Isl., N of Hood Isl., 10-02-1978, coll. W.D. Hope, 22 m, on rocks. Microscopical slides and fragments ZMA POR. 11210, MHNG 18981.

DESCRIPTION:

Two hemispherical fragments, 50 x 40 x 20 and 40 x 20 x 20 mm, heavily encrusted by filamentous and calcareous algae.



FIGS 21-26

Penares saccharis (De Laubenfels). Gardner Isl. 21. Hemispherical fragment of specimen. 22. Ectosomal crust of small oxeas and microrhabds, carried by dichotriaenes. 23, 24. Dichotriaenes and small oxeas. 25. Oxeas and small oxeas. 26. Microrhabds. Scales: fig. 21 = 10 mm; figs 22, 24 = 50 µm; figs 23, = 100 µm; fig. 25 = 200 µm; fig. 26 = 10 µm.

Surface: rough to touch, no apparent oscules.

Consistency: firm. Interior cavernous.

Colour: pale green in formalin; mottled red brown in alcohol; interior lighter brown.

SKELETON:

Ectosomal: a crust of microxeas and microrhabds, carried by dichotriaenes.

Choanosomal: subectosomal palisade of dichotriaenes, irregularly arranged. Interiorly there is an irregular arrangement of oxeas.

Spicules: dichotriaenes, oxeas, small oxeas and microrhabds.

MEGASCLERES:

Dichotriaenes, clads: 150 by 28 µm, rhabd 300 by 30 µm.

Oxeas: 467-*641*-900 by 12-28 µm.

Small oxeas: 66-*140*-170 by 3-8 µm.

MICROSCLERES:

Microrhabds 22-*35*-50 by 2-3 µm. No asters.

Distribution: Galápagos Islands; California.

Remarks: we compared the present specimen with the holotype of *Papyrula saccharis* De Laubenfels, 1930 (USNM 21476), from Lower California and found them well-matched. The cladi of the dichotriaenes are somewhat longer in the type (many measure up to 200 µm), and the small oxeas are not so sharply separated into two categories as in the Galapagos material, although their overall range of measurements is similar. Both specimens lack oxyasters.

Penares apicospinatus n.sp. (Figs 27-33)

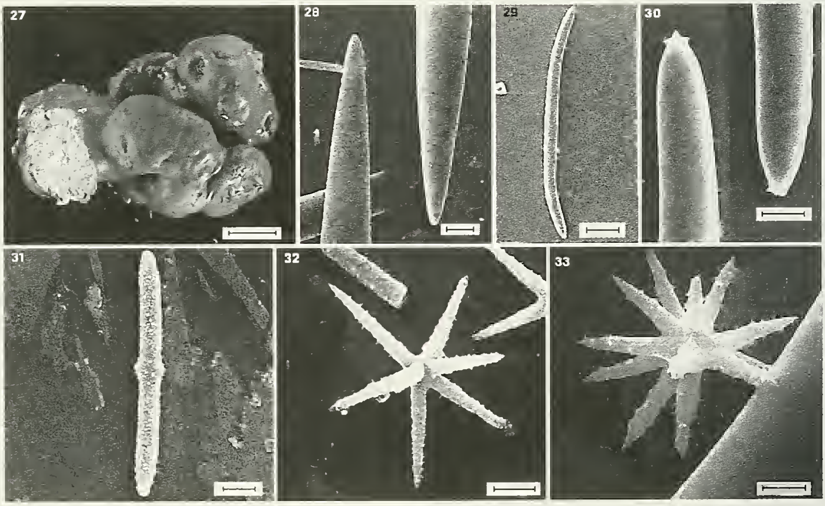
Material studied: Holotype USNM 40754 SEPBOP "Anton Bruun" 18B-794E, James Isl., 00°12'S 90°52'W, 24-09-09-1966, 34 m, volcanic rock dredge. Microscopical slides and fragments ZMA POR 11211, MHNG 18991.

DESCRIPTION:

The holotype specimen consists of six big fragments and some smaller broken-off pieces. Largest fragment is a mass of lobes, 16 cm long, 9 cm high and 10 cm wide, attached to volcanic rock, the other fragments are individual elongate lobes, approximately 7 cm long and 4 cm high and wide, similar to those of the big mass. Each lobe has one or two oscules of 2 mm in diameter, with slightly raised rims. Surface smooth, dull.

Consistency: compressible, firm, rough to the touch. The surface is an easily damaged crust.

Colour: warm chocolate brown on top, somewhat lighter along the sides. The interior is also a lighter orange-brown, and has a clearly radiate structure.



FIGS 27-33

Penares apicospinatus n. sp. Stat. 18B-794E James Isl. 27. Holotype, lobate specimen. 28. Apices of an oxea. 29. Small, curved oxea. 30. Microspined apices of the same. 31. Rugose, small centrotylote microrhabd. 32. Larger oxyaster with low number of rays. 33. Small oxyaster with higher number of rays. Scales: fig. 27 = 40 mm; fig. 28 = 10 µm; fig. 29 = 20 µm; figs 30-32 = 5 µm; fig. 33 = 2 mm.

SKELETON:

Ectosomal: a distinct cortex consisting of a massive deposit of microrhabds and small oxeas carried by the cladomes of the subectosomal triaenes. The cortex has a thickness of 300-400 µm. Pore areas are regularly distributed over the surface; they have a diameter of 50-70 µm and are 40-60 µm apart.

Choanosomal: the cortex is carried by the cladomes of orthotriaenes, which are radially arranged in discrete tracts, in which they are mixed with oxeas. Towards the interior these tracts consist exclusively of oxeas. Diameter of the tracts ca. 150 µm, lying at distances of 150 µm apart. Between the tracts larger canals and large numbers of asters are found, mixed with fewer microrhabds and small oxeas.

Spicules: orthotriaenes, oxeas, small oxeas, microrhabds and oxyasters.

MEGASCLERES:

Orthotriaenes: concentrated subectosomally, clads almost straight (plagiotriaene-like), occasionally reduced: cladome 301 - *553.5* - 694 µm, clads 184 - *324.0* - 412 µm by 32 - *44.8* - 68 µm, rhabd 712 - *1122.0* - 1650 µm by 32 - *50.5* - 56 µm.

Oxeas: curved, gradually tapering, with sharp points: 1426 - *2496.3* - 3130 µm by 21 - *38.8* - 48 µm.

Small oxeas: smooth, curved, doubly angulated, with microspined apices occasionally modified to styles, of variable size, possibly in two size categories: 68 - *127.3* - 169 µm by 4.0 - *6.5* - 9.0 µm.

MICROSCLERES:

Microrhabds: centrotylote, finely rugose, in two size categories: 67 - *91* - 120 by 2 - *5* - 6 µm, and 19 - *27*- 42 µm by 1 - *2* - 4 µm.

Oxyasters: in two distinct size categories, the larger with a barely developed centre and a lower number of rays, the smaller with a more distinct centre and a higher number of rays. Larger: 17 - *26.5* - 37 µm diameter, ray number 6 - *7* - 8. Smaller: 6 - *9.1* - 13 µm in diameter, ray number 8 - *10* - 12.

Etymology: named for the microspined apices of small oxeas.

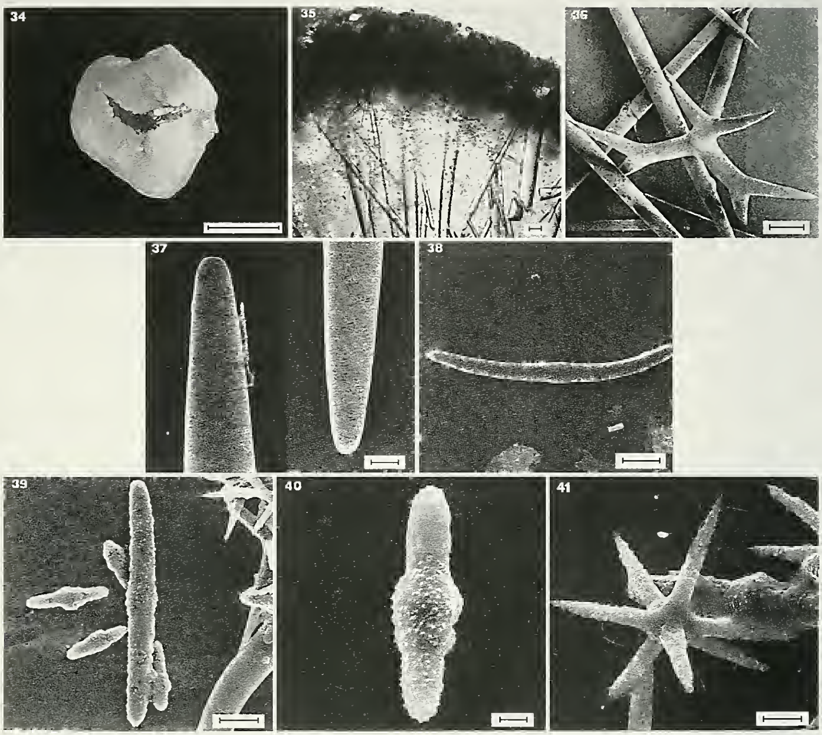
Remarks: the only *Penares* species described from the area is *P. foliaformis* Wilson, 1904; this has much more robust triaenes (140 µm in thickness), with predominantly dichotriaene morphology, bigger and thicker microrhabds. The oxyasters are in a single category with more than 12 rays (7-23).

Penares saccharis (De Laubenfels, 1930) (cf. above) also possesses dichotriaenes, but has no asters .

A further species of *Penares*, *P. scabiosus* n. sp., described below is close to *P. foliaformis*, and dissimilar to the present species in having dichotriaenes and very numerous small (15 µm) centrotylote microrhabds.

Penares scabiosus n. sp. (Figs 34-41)

Material studied: Holotype USNM 43172 SEPBOP "Anton Bruun" 18b-791c, off Seymour Isl., N of Indefatigable Isl. , 00°26'S 090°20'W, 21-09-1966, 95 m, volcanic rocks. Microscopical slides and fragments ZMA POR. 11212, MHNG 18995.



Figs 34-41

Penares scabiosus n. sp. 34. Holotype specimen, Stat. 18B-791C off Seymour Isl. 35. Perpendicular view of the skeleton, ectosomal crust of small oxeas and microrhabds carried by the dichotriaene cladomes. 36. Dichotriaene. 37. Large oxea apices. 38. Small oxea. 39. Centrotylote microspined microrhabds, categories 1-2. 40. Centrotylote microspined microrhabd, categorie 3. 41. Oxyaster with 7 visible rays. Scales: fig. 34 = 10 mm; fig. 35 = 50 µm; fig. 36 = 100 µm; fig. 37, 39 = 10 µm; fig. 38 = 20 µm; fig. 40 = 2 µm; fig. 41 = 5 µm.

Description:

An optically smooth mass, rough to the touch. No apparent oscules. Size: 20 x 25 x 25 mm.

Consistency: firm, crumbly internally.

Colour: pinkish grey in alcohol, interior beige.

Skeleton:

Ectosomal: A crust of small oxeas and microrhabds, 100-200 µm thick, carried by the cladomes of thick subectosomal dichotriaenes. Crust pierced by regularly spaced inhalant openings, 60-200 µm in diameter. Microrhabds overlying the microxeas and filling the insterstices.

Choanosomal: the subectosomal skeleton consists of single dichotriaenes, spaced 250-400 µm apart; between them a dense mass of asters is found. Interiorly, a mass of irregularly intercrossing oxeas with scattered asters is found.

Spicules: dichotriaenes, large oxeas, small oxeas, microrhabds, oxyasters.

MEGASCLERES:

Dichotriaenes: cladome 900 µm, clads 450 µm length by 80 µm in diameter, rhabds 620-1100 µm length and 40-90 µm in diameter.

Oxeas: 2760-3200 µm by 40-80 µm.

Small oxeas, smooth: 44- *75* -106 µm by 4- *6* -10 µm.

MICROSCLERES:

Microrhabds, entirely microspined centrotylote: three sizes averaging 60-43, 21-23 and 15 µm. The smallest category is very numerous.

Oxyasters: 20-38 µm (6-10 rays).

Etymology: the name refers to the rough surface.

Remarks: Penares scabiosus is close to *P. foliaformis* Wilson, 1904, also from the Galápagos, in general characteristics and spicule sizes (Table 6). We were able to compare the present material with the holotype of Wilson (USNM 8291), and found the following differences: the dichotriaenes of *P. foliaformis* have clearly thicker rhabds (140 µm) and the microrhabds have a smaller size range, with the smallest most numerous category of 15 µm lacking in *P. foliaformis*; the oxyasters of *P. foliaformis* are clearly smaller (7-23 µm) and have more numerous rays (12 or more). Habits of the two are also different. The new species differs from *P. apicospinatus* n. sp. and *P. saccharis* De Laubenfels in having robust dichotriaenes and a very small category of microrhabds. *P. saccharis* lacks oxyasters.

TABLE 6

Spicule sizes of *Penares foliaformis* Wilson from Galápagos, compared to *P. saccharis* (De Laubenfels) and to *P. scabiosus* n. sp. Information from literature and ZMA and MHNG material. Measurements (in µm) refer to cladome (dichotriaenes), to length and width (rhabdome of dichotriaenes, oxeas, small oxeas and microrhabds), and to diameter (oxyasters).

Author/collect.	Locality	Dichotriaenes	Oxeas	Small	Microrhabd.	Oxyast.
Penares foliaformis USNM 8291	Galápagos	rhabd. 900 x 140	2300 x 70	——	——	——
P. saccharis De Laubenfels, 1932	California	clad. 120-210 rhabd. 320-435 x 20-30	780 x 22	——	35-145 x 1-3	——
P. scabiosus n.sp. ZMA POR 11212 MHNG 18995	Galápagos	clad. 900 rhabd. 620-1100 x 40-90	2760-3200 x 40-80	44-106 x 4-10	43-23-15	20-38

Stelletta Schmidt, 1862

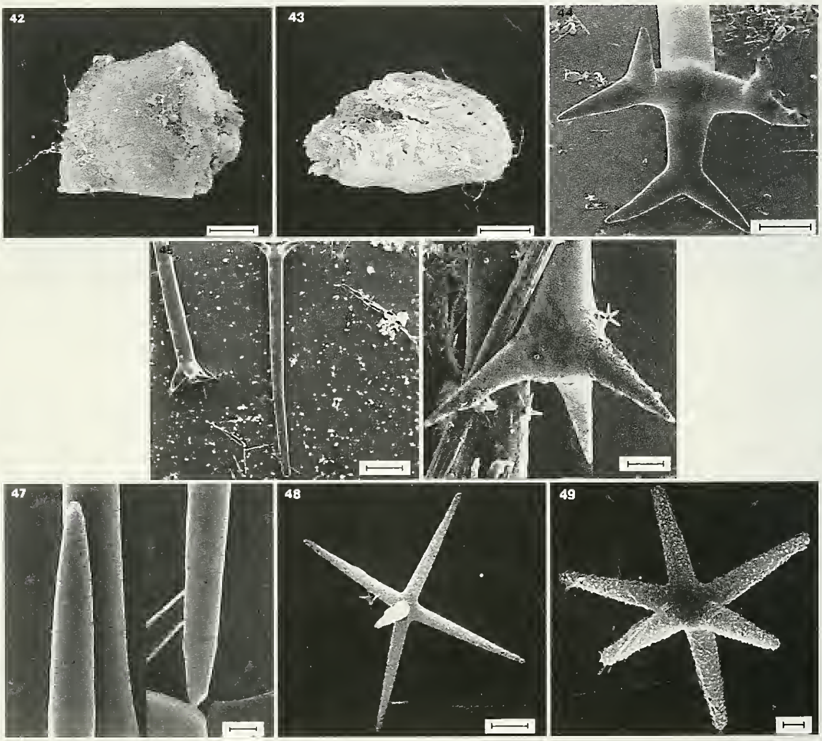
Type species: *Stelletta grubii* Schmidt, 1862 by subsequent designation. (Burton & Rao 1932).

Definition (emended from Topsent 1894): Ancorinidae with two or three types of asters, distributed on both, surface and choanosome or only present in the chanosome. Cortex well developed.

Stelletta eduardoi n. sp. (Figs 42-49)

Material: Holotype USNM 43166 SEPBOP "Anton Bruun" 18B-794E, N coast James Isl., 00°12'S 90°51'W, 34 m, volcanic rocks. Microscopical slides and fragments ZMA POR. 11213, MHNG 18962.

Paratype: SEPBOP "Anton Bruun" 16-66139 , W coast Albemarle Isl., 00°15'S 91°26'W, 0-3 m. Microscopical slides and fragments ZMA POR. 11214, MHNG 21044.



Figs 42-49

Stelletta eduardoi n. sp. Stat. 18B-794E N coast of James Isl. 42. Fragment of holotype specimen. 43. Transversal section of the same. 44. Terminal part of a dichotriaene. 45. Two dichotriaenes and several oxeas and oxyasters. 46. Plagiotriaene. 47. Oxea. 48, 49. Microspined oxyaster and strongylaster-oxyaster. Scales: figs 42, 43= 10 mm; fig. 44 = 100 µm; fig. 45 = 200 µm; fig. 46 = 20 µm; figs 47, 48 = 5 µm; fig. 49 = 2 µm

TABLE 7

Spicule sizes reported for *Stelleta clarella* De Laubenfels, from California, compared to *S. eduardoi* n. sp. Information from literature and ZMA and MHNG material. Measurements (in µm) refer to cladome (triaenes) to length and width (rhabds of triaenes, oxeas) and to diameter and number of rays (euasters).

Author/collect.	Locality	1. Dichotriaenes 2. Plagiotriaenes 3. Anastriaenes * Ortho to dichotriaenes	Oxeas	Euasters
Stelletta clarella	California	——		
		2. rhabd. 2000-3000 x 20-100	3500 x 50	9-15
		3. rhabd. 100-2000 9-15	1400 x 15	——
Bakus & Green, 1987	California	1. rhabd. 550-1880 x 22-33	1118-3119 x 17-52	5.10.18
		2. rhabd. 220-3960 x 2.40	50-850 x 2-7	
		——		
Green & Bakus, 1994	California	* clad. 171-357 rhabd. 300-700 x 39-91	450 x 10	10-13
S. eduardoi n. sp. ZMA POR 11213 MHNG 18962	Galápagos	1. clad. 450-550 rhabd. 1800-3000 x 50-100 2. clad. 200 rhabd. 1800 x 70	2000-3300 x 90	16-32 3-6 rays strong. 8-14 8-10 rays

DESCRIPTION:

Three massive-globular specimens. No apparent oscules. Size: 25-30 x 20 x 5-10 mm.

Consistency: prickly to the touch, compressible to hard.

Colour: beige in alcohol. In cross sections a clear division between a darker coloured cortex and a lighter coloured choanosome is visible.

SKELETON:

Ectosomal: a thin crust of asters carried by subectosomal dichotriaenes.

Choanosomal: radiate architecture with dichotriaenes and oxeas intermingled.

Spicules: dichotriaenes, plagiotriaenes, anatriaenes (only one observed), oxeas and euasters.

MEGASCLERES:

Dichotriaenes, cladome 450-550 µm, rhabdome 1800-3000 µm by 50-100 µm.

Plagiotriaenes, cladome 200 µm, rhabdome 1800 µm by 70 µm.

Oxeas 2000-3300 µm by 90 µm; a single broken anatriaene was observed in one specimen.

MICROSCLERES:

Euasters in two sizes: microspined oxyasters 16- *22* -32 µm, with 3-6 rays, and microspined strongylasters/oxyasters 8- *12* - 14 µm, with 8-10 rays.

Etymology: named after Eduardo Hajdu, Sao Paulo University, Brazil in recognition of his important work on Demosponges.

Remarks: the present specimens were compared with De Laubenfels' holotype of *Stelletta clarella* De Laubenfels, 1930, USNM 21488, from California and with descriptions from other authors (BAKUS & GREEN 1987; GREEN & BAKUS 1994) (Table 7) and several differences were found: the anatriaenes in the type specimen - although also uncommon - are more numerous than the single - possibly foreign - one in the Galápagos material, and in all Californian specimens the euasters are not readily divisible in two categories. *S. clarella* has a special category of malformed ectosomal chiasters forming the surface armour, absent in the new species.

Pachastrellidae Carter, 1875

Dercitus Gray, 1867

Type species: *Hymeniacidon bucklandi* Bowerbank, 1866 by monotypy.

Definition (from SOLLAS 1888): Pachastrellidae in which microscleres are spined microrhabds; toxiform microxeas may be present.

Remark: The concept of *Dercitus* employed here is wider than that of MALDONADO (1993), who restricted the use of the genus to the type species on account of the toxiform microxeas found in it. For *Dercitus*-like species lacking such microscleres he revived the genus *Stoeba*. In our opinion this is an unnecessary restriction and we propose to use *Dercitus* in a wider sense to include all those encrusting pachastrellids with spined microrhabds as microscleres.

Dercitus reptans n.sp. (Figs 50-52)

Material: Holotype USNM 43170 SEPBOP "Anton Bruun" 16-66139, Albemarle Isl., N coast 00°15'S 91°26 W, 25-05-1966, 0-3 m. Microscopical slides and fragments MHNG 18963.

Paratype: ZMA POR. 11215, three fragments, same data as the holotype.

DESCRIPTION:

Three specimens and a few fragments, in the form of long (up to 26 mm) thin (2-4 mm in diameter) creeping, stolon-like branches, here and there encrusting the substrate.

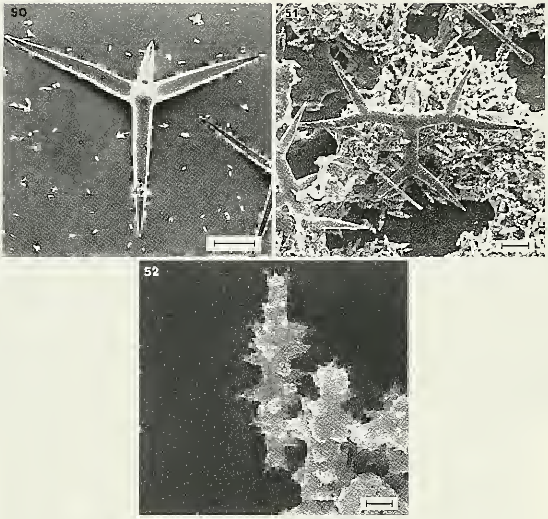
Surface: micronulose, rough. No apparent oscules.

Consistency: hard, easily damaged.

Colour: whitish pink in alcohol.

SKELETON:

Ectosomal: thin cover of acanthorhabds, pierced at irregular distances by the rays of large calthrops.



FIGS 50-52

Dercitus reptans n. sp. Stat. 16-66139 Albemarle Isl. 50. Holotype specimen, calthrops with variable length of rays. 51. Short shafted dichotriaene. 52. Acanthomicrorhabds, irregularly spined. Scales: fig. 50 = 100 µm; fig. 51 = 20 µm; fig. 52 = 2 µm.

Choanosomal: calthrops and dichotriaenes arranged without any organization. Interior cavernous, with very little organic matter.

Spicules: calthrops, dichotriaenes, microrhabds.

Calthrops, large, variable length, cladome up to 670 µm, rays 344-*484*-648 µm by 16-*27*-50 µm.

Short-shafted dichotriaenes, cladome 156-*164*-170 µm, rays 90 by 8-9 µm.

Acanthomicrorhabds, 15-*47*-74 µm by 2-8 µm, irregularly spined.

Etymology: the name refers to its habit.

Remarks: DE LAUBENFELS (1930, 1932) described *Dercitus syrmatitus* from California. We compared the type specimen (USNM 21438), from California, with our material and found them to be quite dissimilar. *D. syrmatitus* is agglutinating a mass of sand and its spicule dimensions are about half to one third of those of *D. reptans* n.sp. (calthrops have cladomes of average 220 µm, rays are 140-150 by 11-15 µm), no dichotriaenes are found in *D. syrmatitus*.

Poecillastra Sollas, 1888

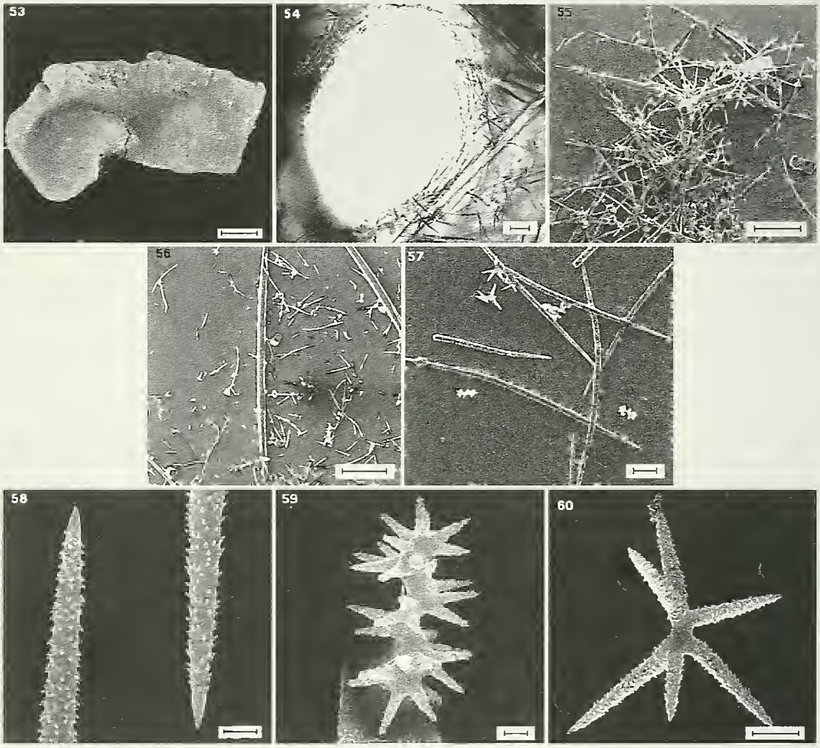
Type species: *Normania crassa* Bowerbank, 1869 by monotypy.

Definition (emended from SOLLAS 1888): Pachastrellidae with plate-like form, with two different surfaces, upper oscular and inferior poriferous. Megascleres oxeas and triaenes, normally orthotriaenes and orthodichotriaenes. Microscleres streptasters and microxeas.

Poecillastra cribraria Wilson, 1904 (Figs 53-60)

Poecillastra cribraria Wilson, 1904: 105, pl. 14, figs 9-12, pl. 15, figs 1-4, pl. 6, figs. 1, 3.

Material: SEPBOP "Anton Bruun" 18B-791C, off Seymour Isl., N of Indefatigable Isl. 00°26'S 90°20'W, 21-09-1966, 95 m. Microscopical slides and fragments ZMA POR. 11216, MHNG 20598.



FIGS 53-60

Poecillastra cribraria Wilson. Stat. 18B-791C, off Seymour Isl. 53. Fragment of specimen. 54. Choanosomal section. 55. One of the rare triaenes, microxeas. 56. Oxeas and microspined microxeas. 57. Microspined microxeas, spirasters and plesiasters. 58. Apices of microxea. 59, 60. Spiraster and plesiaster. Scales: fig. 53 = 10 mm; fig. 54 = 50 µm; fig. 55 = 100 µm; fig. 56 = 200 µm; fig. 57 = 20 µm; figs 58, 59 = 2 µm; fig. 60 = 5 µm.

DESCRIPTION:

A fragment of a lamellar, linguiform plate, 56 x 26 x 4 mm with differentiated surfaces, one with a translucent membrane and small pores (2-3 mm) which likely represents the oscules. Laterally there is a fringe of fine spicules. The other surface is irregular, undulated, slightly concave, with the same membrane but no pores visible.

Surface: slightly rough, aquiferous canals are visible, ramifying under the surface.

Consistency: firm.

Colour: light brown in alcohol.

SKELETON:

Ectosomal: a crust of spirasters and tangentially arranged microxeas carried by the subectosomal triaenes, leaving regularly spaced pore fields of 50-120 µm in diameter.

Choanosomal: uniformly alveolate, with meshes covered by oxeas and spirasters.

Spicules: triaenes, oxeas, microxeas, spirasters, plesiasters.

MEGASCLERES:

Rare orthotriaenes, cladome 500-*579*-664 µm, rhabdome 100-200 µm by 13-*18*-26 µm.

Oxeas 448-*1554*-2000 (in the type up to 2500 µm) by 18-*22*-35 µm.

MICROSCLERES:

Microspined microxeas 112-*136*-171 µm by 2-*3*-5 µm.

Spirasters 10-*12*-13 µm.

Plesiasters 13-*18*-26 µm.

Distribution: Galápagos Islands.

Remarks: the identification was checked against Wilson's holotype of *Poecillastra cribraria*, USNM 8295, from Galápagos and very few discrepancies were found. Triaenes are rare in both specimens.

Vulcanella Sollas, 1886

Type species: *Sphinctrella horrida* Schmidt, 1870 by subsequent designation (DE LAUBENFELS 1936).
Synonyms: *Sphinctrella* Schmidt, 1870 (preoccupied)
Sphincterella De Laubenfel, 1936.

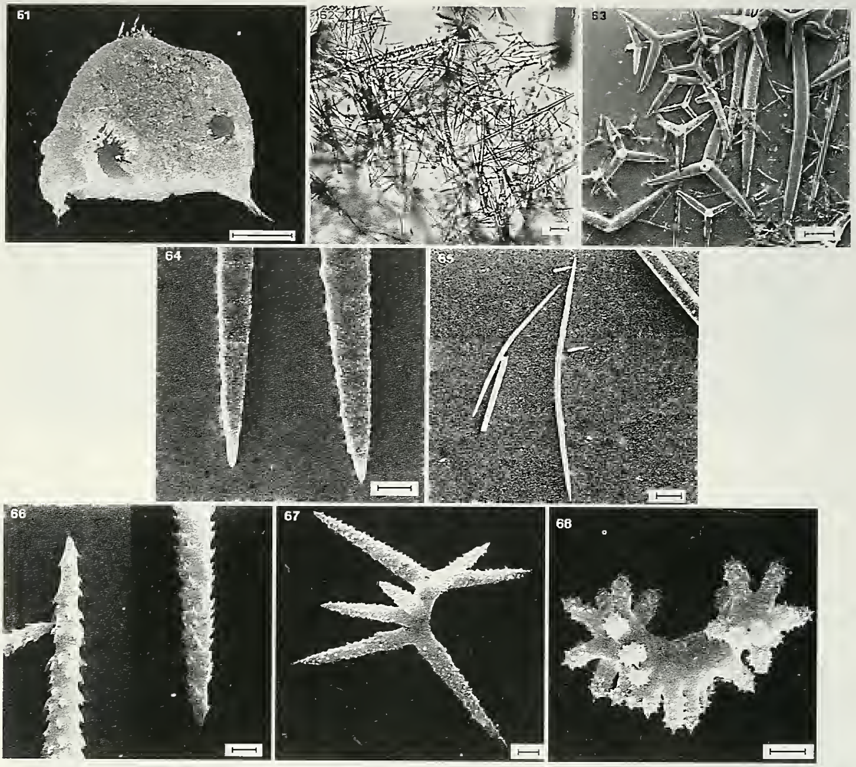
Definition (emended from SOLLAS 1886): Pachastrellidae encrusting or massive with pores generally dispersed and only few, highly specialized oscules, opening to a large cloaca. Spicules: calthrops of different sizes, oxeas, rugose or microspined microxeas and asters

Remarks: The genus *Vulcanella* is revived here to replace the preoccupied *Sphinctrella* Schmidt, 1870. DE LAUBENFELS (1936) erected *Sphincterella* for this group, but overlooked that *Vulcanella* Sollas was available as a replacement name. The fact that *Sphinctrella* was preoccupied did not prevent authors from persisting in its use for sponges, and neither *Vulcanella* nor *Sphincterella* gained acceptance so far.

Vulcanella tricornis (Wilson, 1904) (Fig. 61-68)

Poecillastra tricornis Wilson, 1904: 101, pl. 13, figs 12-14, pl. 14, fig. 8.

Material: SEPBOP "Anton Bruun" 18B-791C, off Seymour Isl., N of Indefatigable Isl. 00°26'S 90°20'W, 21-09-1966, 95 m, volcanic rocks. Microscopical slides and fragments, ZMA POR. 11217, MHNG 18983.



FIGS 61-68

Vulcanella tricornis (Wilson). Stat. 18B-791C off Seymour Isl. 61. Oval specimen bearing two porocalices. 62. Choanosomal skeleton, annulated oxea and microxea. 63. View of calthrops and oxeas, microxeas and annulated oxeas. 64. Apices of annulated oxea. 65. View of the microspined microxea. 66. Apices of microspined microxea. 67. Spiraster. 68. Plesiaster. Scales: fig. 61 = 10 mm; fig. 62 = 50 µm; fig. 63 = 100 µm; fig. 64 = 5 µm; fig. 65.= 20 µm; figs 66-68 = 2 µm.

DESCRIPTION:

Oval to round sponge, 27 x 30 x 10 mm, with the surface bearing three porocalices of 4-5 mm in diameter, surrounded by fringes of long oxeas, approximately 7000 µm long.

Surface: optically smooth but rough to the touch.

Consistency: hard.

Colour: light brown in alcohol.

SKELETON:

Ectosomal: a crust of microscleres

Choanosomal: a confused reticulation of smaller annulated oxeas and microxeas. Many aquiferous spaces.

Spicules: calthrops, oxeas, smaller annulated oxea, microxeas, spirasters, plesiasters.

MEGASCLERES:

Calthrops: cladome up to 1000 µm, cladi 440-860 µm, rhabd 30-*55*-100 µm
Oxeas of the porocalices: up to 7000 µm by 18 µm.
Choanosomal large oxeas 2500-3500 µm by 170-180 µm.
Small annulated oxeas, annules microspined: 205-*298*-450 µm by 8 µm

MICROSCLERES:

Microxeas, optically smooth but microspined: 64-*85*-128 µm by 3 µm.
Spirasters 9-*10*-14 µm.
Plesiasters 10-*13*-16 µm.

Distribution: Galápagos Islands.

Remarks: the holotype *V. tricornis* (Wilson, 1904), from Galápagos, has larger calthrops (cladome up to 1400 µm), but in all other aspects it closely resembles our specimen (Table 8).

TABLE 8

Spicule sizes reported for *Vulcanella tricornis* (Wilson), holotype. Information from literature and ZMA and MHNG material. Measurements (in µm) refer to length and width (cladi and rhabds, oxeas from porocalices and choanosoma, annulated oxeas, microxeas, spirasters and plesiasters) and number of rays (plesiasters, spirasters).

Author/collect.	Locality	Calthrops.	Oxeas porocal.	Oxeas choanosome	Annulated oxeas	Microxea	Spirast. *Plesiast.
Vulcanella tricornis Holotype	Galápagos	700 -1000	25000	2500-5000 x 85-135	400-500 x 8-16	120	20 x 2-3 24-26 x 8 *20 x 7
ZMA POR 11217 MHNG 18983	Galápagos	1000 440-860 x 30-100	7000 x 18	2500-3500 x 170-180	205-450 x 8	64-128 x 3	9-14 *10-16

Geodiidae Gray, 1867

Geodia Lamarck, 1815

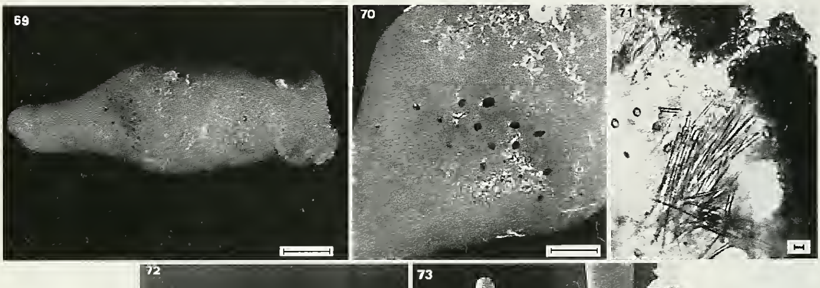
Type species: *Geodia gibberosa* Lamarck, 1815 by monotypy.

Definition (emended from VON LENDENFELD 1910): Geodiidae with aquiferous system afferent and efferent independently, with well developed and large subectosomal spaces. Megascleres triaenes. Microscleres sterrasters and euasters of different types.

Geodia media Bowerbank, 1873 (Figs 69-76)

Geodia media Bowerbank, 1873: 13, pl II, figs. 24-29; von Lendenfeld, 1910: 194, pl. 16, figs. 1-21, pl. 17, figs. 1-22.
Synops(?) *media*, Sollas, 1888: 266.

Material: USNM 35786 SEPBOP "Anton Bruun" 18B-794A, James Isl., Sullivan Bay, shore and tidepool, 00°12'S 90°50'W, 23-09-1966, microscopical slides and fragments ZMA POR. 11218, 11219, MHNG 21045, 21047; 18B-795D, E. of Albemarle Isl., 00°37'S 90°51'W, 78 m, microscopical slides and fragments ZMA POR. 11220, MHNG 18965; 16-6695, N coast Indefatigable Isl., 00°45'S 090°20'W, 17-05-1966, 0-1m, microscopical slides and fragments ZMA POR. 11221, MHNG 21046; Indefatigable Isl., 00°45'S 090°20'W, 17-05-1966, 2-3 m, microscopical slides and fragments: MHNG 21048; 16 HA 106 Seymour Isl., 00°26' S 090°17'W, 15-05-1966 0-5 m, microscopical slides and fragments MHNG 20606; 16-66110; Indefatigable Isl., 00°44'S 090°17'W, 19-05-1966.



FIGS 69-76

Geodia media Bowerbank, Stat. 18B-794A James Isl. 69. Specimen with two flattened pore sieves. 70. Enlarged view of one of the pore sieve. 71. Ectosomal crust of sterrasters and subectosomal oxeas and sterrasters. 72. Plagiotriaene. 73. Apices of oxea. 74. Ectosomal sterraster. 75. Oxyaster with 8 rays. 76. Oxyspheraster with 10-11 rays. Scales: figs 69, 70 = 10 mm; fig. 71 = 50 µm; fig. 72 = 100 µm; figs 73, 76 = 2 µm; fig. 74 = 10 µm; fig. 75 = 5 µm;

DESCRIPTION:

One specimen massive elongated and several fragments. Size 13-37 x 10-15 x 5-18 mm.

Surface smooth, without visible surface membrane. Two flattened pore sieves visible in the specimen and in the largest fragments. Pores inconspicuous, 0.5 mm in diameter.

Consistency hard, brittle.

Colour: yellowish to cream-white in alcohol.

SKELETON:

Ectosomal: a crust of sterrasters.

Choanosomal: subectosomal orthotriaenes carry the crust of sterrasters. Towards the interior oxeas predominate.

Spicules: plagiotriaenes, anatriaenes, oxeas, small oxeas, ectosomal sterrasters, oxyasters, oxyspherasters.

MEGASCLERES:

Plagiotriaenes, cladome 160-*284*-520 µm, rhabd 500- *925*-1080 µm 17-40 µm, cladi 120-*184*-303 µm.

Anatriaenes, scarce, and mostly broken, rhabd 600 µm, cladome 30 µm, cladi 10-20 µm.

Oxeas 800-*1048*-1350 µm by 10-*16*-20 µm.

Small oxeas 86-*122*-148 by 4 µm.

MICROSCLERES:

Ectosomal sterrasters, oval, 50-*63*-74 by 60 µm, a second category of immature (?) sterrasters measures 19-*42*-64 µm.

Oxyasters 12-*18*-24 µm, with 8 rays.

Oxyspherasters 6-*8*-13 µm, with 10-11 rays.

Distribution: Galápagos Islands; Pacific coasts of Mexico and Panama (VON LENDENFELD 1910)

Remarks: the identification is based on the redescription of this species by VON LENDENFELD (1910) (who examined Bowerbank's type). In general, there is a good correspondence in categories and sizes of the various spicule types, but in our specimens the thickness of the megascleres is at the lower range compared to the material described by VON LENDENFELD (e.g. the thickness of the plagiotriaene shaft is 30-80 µm in Lendenfeld's material against 17-40 in our material).

Erylus Gray, 1867

Type species: *Stelletta mammillaris* Schmidt, 1862 by monotypy.

Definition (from VON LENDENFELD 1910): Geodiidae with uniporal afferent and efferent surfaces or larger oscules. Triaenes short-shafted ortho- or plagiotrianes; no ana- or protriaenes. Sterrasters usually flattened into aspidasters.

Erylus cf. **oxyaster** von Lendenfeld, 1910 (Figs 77-79)

?Erylus oxyaster Lendenfeld, 1910: 268, pl. 3, figs 29-35, pl. 4, figs 1-43.

Material: SEPBOP "Anton Bruun" 18B-794A, James Isl., 00°12'S 90°50'W, 23-09-1966, intertidal; 18B-795, E of Albemarle Isl., 00°37'S 90°51'W, 1966, 78 m. Microscopical slides and fragments ZMA POR. 11222, MHNG 18966.

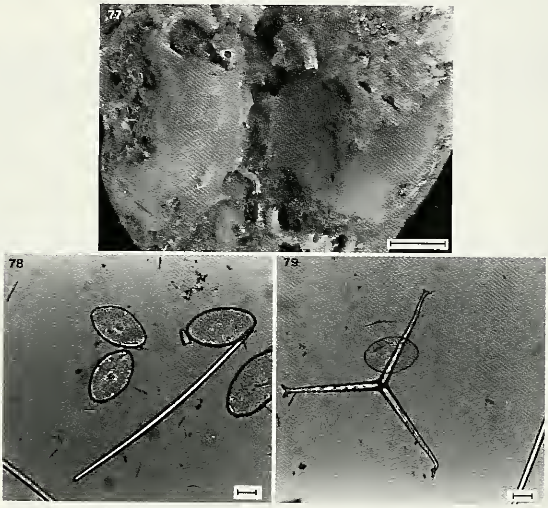
DESCRIPTION:

Encrusting on stone, slightly elongate, up to 30 x 10 x 5 mm.

Surface: smooth, no oscules visible.

Consistency: hard.

Colour: white, with brown spots, in alcohol.



FIGS 77-79

Erylus cf *oxyaster* von Lendenfeld. Stat. 18B-794A, James Isl. 77. Encrusting specimen. 78. Strongyloxeas, aspidasters and microrhabds. 79. Dichotriaene, axe of an oxea, aspidaster, microrhabds and diactine oxyaster. Scales: fig. 77 = 10 mm; figs 78, 79 = 50 μm.

SKELETON:

Ectosomal: a crust of aspidasters, 2-3 layers thick, with microrhabds arranged tangentially in the interstices between the aspidasters.

Choanosomal: subectosomal dichotrianes carry the crust of aspidasters. Interiorly strongyloxeas are confusedly arranged.

Spicules: dichotriaenes, strongyloxeas, microrhabds, aspidasters, oxyasters of two sizes.

MEGASCLERES:

Dichotriaenes, cladome 420-*820*-1000 μm, rhabd 700 μm by 80 μm , cladi 500 μm by 60 μm.

Strongyloxeas 410-*600*-1000 µm by 12-*20*-25 µm.

MICROSCLERES:

Microspined microrhabds, centrotylote: 66-*80*-98 µm by 4-8 µm.
Aspidasters oval, thin: 61-*95*-189 by 74-*95*-139 µm, thickness 16 µm.
Big oxyasters, diactine to tetractine, 29-*35*-60 µm, with 2-4 rays.
Small oxyasters 13-*22*-25 µm, with 12 rays.

Distribution: Galápagos Islands

Remarks: the present identification is made with hesitation, because we noted considerable differences between VON LENDENFELD's description and our specimens were found: von Lendenfeld recorded normally shaped oxeas of 1800-2900 by 60-85 µm (against our strongyloxeas of 400-1000 by 12-25 µm) and aspidaster size 208-243 by 125-150 µm (against our 61-189 by 74-139 µm). Nevertheless, it is probable that the specimens are conspecific because the other spicule types are in the same size range and the overall spicule geometries are similar. Of all the Pacific *Erylus* species described so far, *E. oxyaster* is obviously closest and its type locality is also Galápagos.

Order LITHISTIDA
Corallistidae Sollas, 1888

Corallistes Schmidt, 1870

Type species: *Corallistes typus* Schmidt, 1870 by subsequent designation (De Laubenfels, 1936).

Definition: (from SOLLAS 1888) Corallistidae in which the ectosomal megasclere is a dichotriaene and the microscleres are spirasters. The pores are simple.

Corallistes isabela n.sp. (Figs 80-86)

Material: Holotype USNM 43167 SEPBOP "Anton Bruun" 18B-795, E of Albemarle Isl., 00°37'S 90°51'W, -1966, 78 m. Microscopical slides and fragments, ZMA POR. 11237, MHNG 20605.

DESCRIPTION:

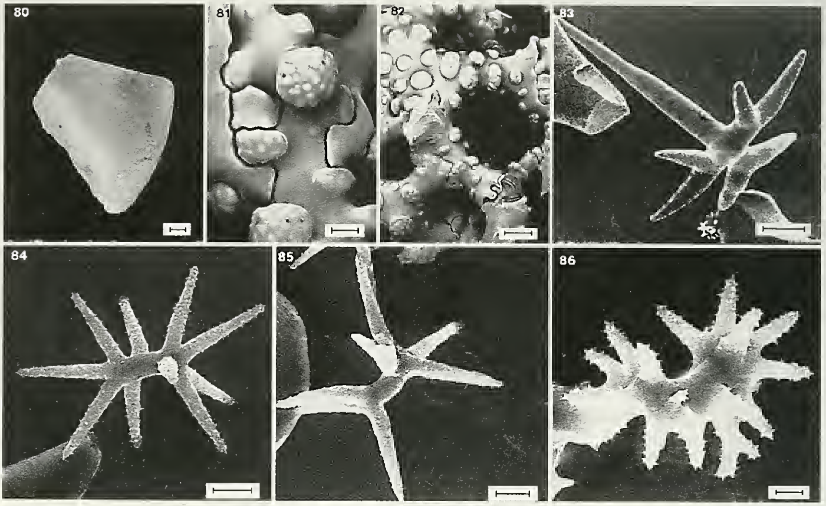
A small fragment of a flattened cup or plate (similar to *C. typus*), with rounded margin, with differentiated surfaces, upper surface without visible apertures, the lower with small oscules of 1 mm in diameter. A clearly visible cortical region in cross section.

Consistency: hard, granular.

Colour: light brown to cream in alcohol.

SKELETON:

Ectosomal: crust of dichotriaenes arranged with the cladomes outwards and rhabdomes perpendicular to the surface. Alternating smaller and larger dichotriaenes. Bundles of oxeotes penetrate the surface. Microscleres are abundant at the surface as well as between the rhabds of the dichotriaenes.



FIGS 80-86

Corallistes isabela n. sp. Stat. 18B-795 E. of Albemarle Isl. 80. Fragment of the holotype, a flattened cup. 81, 82. Knobbed desmas. 83. Large dichotriaenes. 84, 85. Amphiasters, 86. Spiraster. Scales: fig. 80 = 10 mm; figs 81, 83 = 20 μm; fig. 82 = 50 μm; figs 84, 85 = 5 μm; fig. 86 = 2 μm.

Choanosomal: the usual tight reticulation of knobbed desmas, with bundles of oxeotes spaced out regularly. In between desmas abundant microscleres are found.

Spicules: Dichotriaenes in two sizes, desmas, oxeotes, amphiasters, spirasters.

MEGASCLERES:

Large dichotriaenes , cladome 329-540 μm, cladi 282 μm, rhabd 14-40 μm.

Small dichotriaenes, cladome averaging 120 μm, cladi 60-70 μm, rhabdome 229-269 by 23 μm.

Desmas 526-959 by 129-327 μm.

Oxeotes, long, mostly broken off, thus no definite length can be given, but certainly over 1000 by 1-5 μm.

MICROSCLERES:

Short-shafted, thick-rayed amphiasters averaging 42 μm.

Short singly-arched spirasters averaging 23 μm.

Etymology: After its origin: Albemarle or Isabela Island.

Remarks: C. isabela n. sp. and Atlantic *C. typus* Schmidt 1870 are similar in general morphology: small cups with rounded margins. Two principal differences exist between them: sizes of dichotriaenes and amphiasters (Table 9). *C. isabela* n. sp. has two sizes of dichotriaenes. Cladome of the larger category of dichotriaenes is twice as big as that of *C. typus*. Rhabdome of the smaller category is also longer than those of *C. typus*. *C. isabela* n. sp. also has larger amphiasters than *C. typus*.

TABLE 9

Spicule sizes reported for *Corallistes isabela* n. sp. compared to *Corallistes typus* Schmidt. Information from literature and ZMA and MHNG material. Measurements refer to cladome, to length and width (desmas, rhabds, oxeotes) and to diameter (amphiasters, spirasters).

Author/coll.	Locality	Desmas	Dichotriaenes 1. large 2. small	Oxeotes	*Amphiasters **Spirasters
Corallistes typus	Florida	——	——	——	——
Sollas, 1888	Pernambuco	Tuberculate	rhabd. 238-320 x 32	701 x 4	**20-24
van Soest & Stentoft, 1988	Caraïbe	300-360 x 15-24	clad. 90-300 rhabd. 130-380 x 15-24	700-1260 x 4-8	**14-26
C. isabela n. sp. ZMA POR 11237 MHNG 20599	Galápagos	Knobbe-like 526-959 x 129-327	1. clad. 329-540 rhabd. 14-40 2. 120 229-269 x 23	over 1000 x 1-5	* 42 **23

Order SPIROPHORIDA

Tetillidae

Genus **Cinachyrella** Wilson, 1925

Type species: *Tetilla hirsuta* Dendy, 1889 by subsequent designation (RÜTZLER 1987).

Definition (from RÜTZLER 1987): Tetillidae with porocalices , without cortex.

Cinachyrella globulosa n. sp. (Figs 87-92)

Material: Holotype USNM 43164 SEPBOP "Anton Bruun" 18B-794E, James Isl., 00°12'S 90°52'W, 24-09-1966, 34 m, rock dredge. Microscopical slides and fragments ZMA POR 11223, MHNG 20597.

DESCRIPTION:

Fragment of a globular sponge with prominent porocalyces.

Surface: hispid, arenaceous.

Consistency: firm.

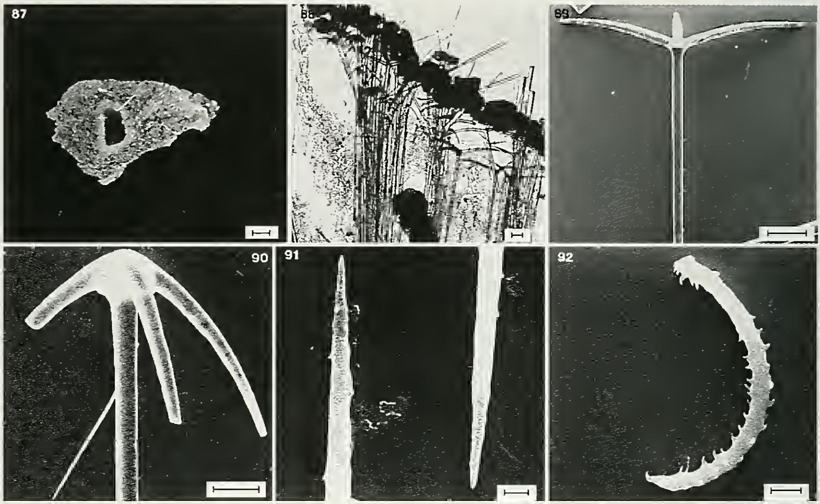
Colour: grayish white in alcohol.

SKELETON: predominantly radiate.

Spicules: orthotriaenes, plagiotriaenes, anatriaenes, oxeas, microxeas, sigmaspires.

MEGASCLERES:

Orthotriaenes, cladome 246-*305*-386 µm, rhabds 920-*1125*-1700 by 20 µm; cladi 140-*208*-300 µm.



FIGS 87-92

Cinachyrella globulosa n. sp. Stat. 18B-794E James Isl. 87. Holotype. View of prominent porocalyx in fragment of globular specimen. 88. Skeletal cross section, choanosomal and surface view. 89. Cladome of an orthotriaene. 90. Anatriaene. 91 Microspined apices of microxea. 92. Sigmaspire. Scales: fig. 87 = 10 mm; fig. 88 = 50 µm; fig. 89 = 100 µm; fig. 90 = 20 µm; fig. 91 = 1 µm ; fig. 92 = 2 µm.

Plagiotriaenes, cladome 140-200 µm, rhabds 2000-3000 by 10-15 µm, cladi 140-200 µm.

Anatriaenes: cladome 90-100 µm, rhabds 2520-*2687*-2900 by 10 µm, cladi 100 µm .

Oxeas: 1840-*2896*-4480 µm by 20 µm.

MICROSCLERES:

Microxeas 57-*80*-120 µm by 0.5-1.0 µm .

Sigmaspires: 10-*12*-16 µm.

Etymology: the name refers to its morphology.

Remarks: through the high proportion of plagio- and orthotriaenes the species is similar to Caribbean *Cinachyrella arenosa* (VAN SOEST & STENTOFT 1988 as *Cinachyra*), but this species has trichodragmata in addition to the microxeas and sigmaspires.

Order HADROMERIDA Topsent, 1900
Clionidae Gray, 1867

Genus **Cliona** Grant, 1826

Type species *Cliona celata* Grant, 1826 by monotypy.

Definition (emended from TOPSENT 1900): Excavating Clionidae of which the spiculation includes tylostyles, microxeas and spirasters. Either of these microsclere categories may be absent.

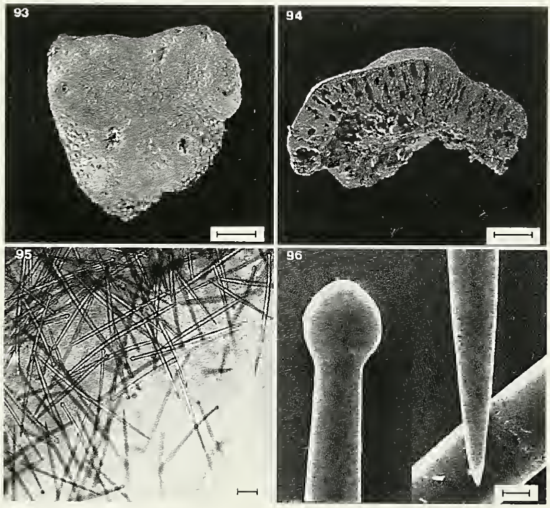
Cliona chilensis Thiele, 1905 (Figs 93-96)

Cliona chilensis Thiele, 1905: 409, figs 28, 29, 36a-c;
Pseudosuberites melanos De Laubenfels *in* DESQUEYROUX 1972: 15, figs 35-37, 130, 131;
Pseudosuberites pseudos Dickinson, 1945: 38, pl. 70, fig. 140, pl. 71, fig. 141, 142, pl. 72, fig. 143;

Material: USNM 37951 Punta Vicente Roca, stat. 8 00°5'S 090°W; coll. W.D. Hope, 1978, 18 m, microscopical slides and fragments ZMA POR. 11224, MHNG 21050; ZMA POR. 11225, MHNG 18821; 18B-794E, N coast James Isl., 00°12'S 090°52'W, 24-09-1966,.34 m, rock dredge, microscopical slides and fragments ZMA POR. 11226, MHNG 21049; 18B 795 D, E of Albemarle Isl., 00°37'S 90°51'W, 78 m.

DESCRIPTION:

Massive, globular sponges with surface covered by the characteristic inhalant *Cliona* papillas. Material fragmented with largest fragment 100 x 100 x 40 mm, papillas approximately 4 mm in diameter. Oscules on low prominences, isolated, about 3 mm in diameter, lying 3-5 cm apart. In cross section inhalant and exhalant canals dominate the choanosomal structure.



FIGS 93-96

Cliona chilensis Thiele. Stat. 18B-794E James Isl. 93. View of the massive specimen. 94. Cross section of the same. 95. General view spicules of the tylostyle palisade. 96, head and apex of a tylostyle. Scales: figs 93, 94 = 10 mm; fig. 95 = 50 µm; fig. 96 = 5 µm.

Consistency: firm, cartilaginous.

Colour: yellow orange, dark brown in alcohol.

SKELETON:

Ectosomal: dense palisade of tylostyles with points outward.

Choanosomal: directly under the palisade the skeleton is thoroughly confused with tylostyles arranged criss-cross. Further down into the choanosome the tylostyles are arranged along the regularly spaced aquiferous canals. Pigment granules are abundant.

Spicules: tylostyles 213-*280*-356 by 8-10-14 µm.

Distribution: Galápagos Islands; South East Pacific coast, from Lower California to Chiloé (Chile).

Remarks: comparisons with the holotype and paratype (here designated) of *C. chilensis* Thiele, ZMB 2233, ZMB 2235, from Calbuco, Chile, and with the holotype of *Pseudosuberites pseudos* Dickinson, 1945, (AHF 21) from Gulf of California revealed that all are conspecific. This *Cliona* species assumes the gamma-form also known from *C. celata* and *C. viridis* in the Eastern Atlantic. A difference with *C. celata* is the arrangement of the oscules in isolated mounds versus the arrangement in rows in *C. celata*. From *C. viridis* the present species differs in lacking microscleres. THIELE (1905) reports some spirasters, but we have not observed these in his type material.

Chondrillidae Gray, 1872

Chondrilla Schmidt, 1862

Type species: *Chondrilla nucula* Schmidt, 1862 by subsequent designation (DE LAUBENFELS 1936).

Definition (emended from WIEDENMAYER 1977): Chondrillidae with a strong cortex reinforced by euasters of oxyspheraster type.

Chondrilla verrucosa n. sp. (Figs 97-102)

Material: Holotype USNM 37918 Albemarle Isl., coll. Rofen, 17-05-1966, microscopical slides and fragments ZMA POR 11227, MHNG 20616.

Paratype: ZMA POR. 11228, SEPBOP "Anton Bruun" stat. 16-66139, Albemarle Isl., N coast, 00°15'S 91°26'W, 25-05-1966, 0-3 m, microscopical slides and fragments, MHNG 21051.

DESCRIPTION:

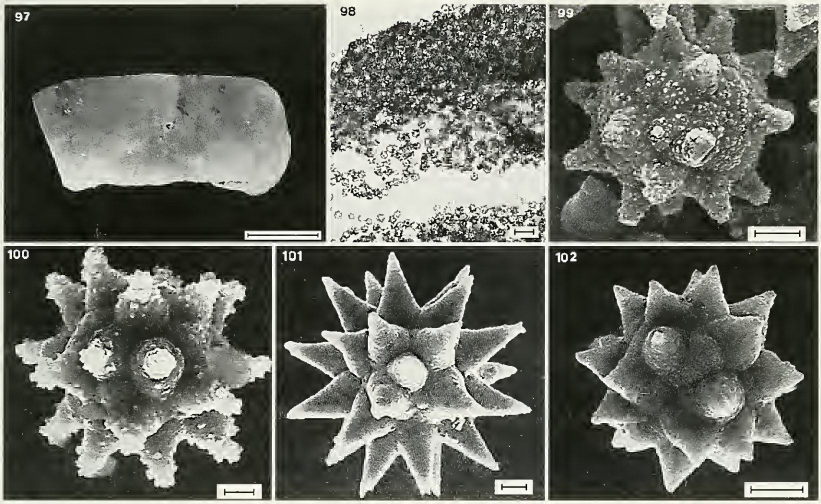
Thickly encrusting, rounded edges, smooth surface, no visible oscules. Size of holotype 2 x 1.5 x 0.5 cm, of paratype 4 x 1.5 x 0.7 cm.

Consistency: rubbery, tough.

Colour: brownish grey, somewhat mottled.

SKELETON:

Ectosomal: a clearly distinguishable cortex of about 160-180 µm in thickness separated from the choanosome by a series of subcortical cavities.



Figs 97-102

Chondrilla verrucosa n. sp. Stat. 16-66139 Albemarle Isl. 97. Fragment of holotype specimen. 98. Surface crust of spherasters. 99, 100. Spherasters with warted surface and rounded rays. 101, 102 spherasters with pointed rays. Scales:fig. 97 = 50 mm; fig. 98 = 50 µm; figs 99, 100 = 5 µm; fig. 101 = 2 µm; fig. 102 = 5 µm.

Choanosomal: the spherasters form a dense surface crust and surround internal aquiferous spaces. Relatively high proportion of spicules.

Spicules:

Spherasters only, mostly exhibiting a characteristic warty surface, in a wide size range, possibly separable into two categories:

Strongylospherasters scarcely found in the spicule slides, but numerous in the SEM slides, 21-*26*-30 µm in diameter.

Spherasters with pointed rays 22-*27*-32 µm in diameter.

Etymology: the name refers to the warty spherasters.

Remarks: this is the first record of the genus *Chondrilla* from the South East Pacific. The warty spherasters are the main distinction from other *Chondrilla* species; this feature is not easily recognized in light microscopy, so it may turn out to be a feature found in other *Chondrilla* species, too. The new species may be close to *Chondrilla acanthaster* De Laubenfels, 1954 from the Palau Islands, but its asters are described as being clearly spined and they are clearly smaller (only 17-22 µm). We compared our specimens with type specimens of *Chondrilla nucula* Schmidt, 1862 (LMJG 15108, from Quarnero. Schizotypes: BMNH 1867:7:26:1, BMNH 1867:7:26:30 and BMNH 1867:3:11:97) and found that this species is clearly distinguishable from *C. verrucosa* n. sp. principally by two differences: the spherasters with warty surface and pointed rays, the existence of two categories, oxyspherasters and strongylospherasters in *C. verrucosa* n. sp. and only one smooth category in *C. nucula*; the second difference is the thinness of the cortex: 160-180 µm in *C. verrucosa* and 1500-2000 µm, in *C. nucula*.

Chondrosia Nardo, 1842

Type species: *Chondrosia reniformis* Nardo, 1847 by monotypy.

Definition: Chondrillidae without spicules.

Chondrosia cf. **chucalla** De Laubenfels, 1954

Chondrosia reniformis sensu Topsent, 1895: 517 (in part: Galápagos material)
Chondrosia chucalla De Laubenfels, 1954: 254, text. fig. 178; Hooper & Wiedenmayer 1994: 126.

Material: ZMA POR. 11229, Galapagos Isl., Indefatigable Isl., 0.6 m, 17-05-1966 coll. R. Rofen.

Description:

Thickly encrusting, on the base of a hydroid colony, size 15 x 15 x 10 mm.
Surface: smooth.
Colour: dark grey in alcohol.
Consistency: rubbery, slippery.

Skeleton:

Absent; a distinct darker coloured cortical region of 450-500 µm in thickness is developed.

Distribution: Galápagos Islands; Australia, W(?) and Central Pacific Ocean (Hooper & Wiedenmayer 1994); Palau, Hawaii (De Laubenfels 1954).

Remarks: the specific identification of *Chondrosia* species on casual light microscopical examination of unstained histological section is not really possible. The name assigned to our specimen is based on the fact that the description of *C. chucalla* does not conflict with the characters described above, and that it is entirely possible that its distribution extends across the Pacific.

Latrunculiidae Topsent, 1922

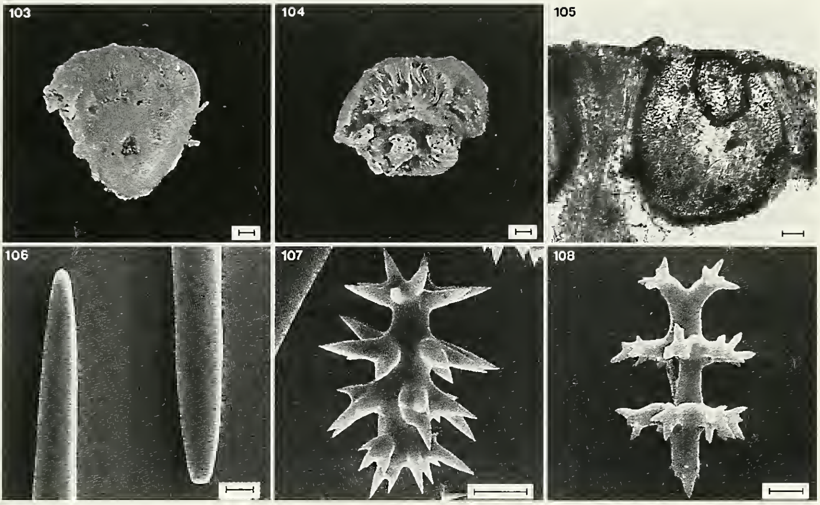
Sigmosceptrella Dendy, 1922

Type species: *Spirastrella fibrosa* Dendy, 1897 by subsequent designation (Dendy 1922).

Definition (provisionally deduced from Kelly-Borges & Vacelet 1995): ?Latrunculiidae encrusting to massive. Megascleres styles or oxeas. Microscleres spinorhabds, with 3-4 whorls of spines, derived from sigmiform rhabds.

Sigmosceptrella hospitalis n.sp. (Figs 103-108)

Material studied: Holotype USNM 40756 SEPBOP "Anton Bruun" 18B-794E, James Isl., 00°12'S 90°52'W, 24-09-1966, 34 m, rock dredge. Microscopical slides and fragments ZMA POR. 11230, MHNG 21019.



FIGS 103-108

Sigmosceptrella hospitalis n. sp. Stat. 18B-794 James Isl. 103. Holotype specimen. 104. Cross section of the same. 105. Surface holes containing microcrustacea, ectosomal crust of microscleres and oxea bouquets. 106. Apices of oxea. 107. Spinorhabd. 108. Sigmorhabd. Scales:figs 103, 104 = 10 mm; fig. 105 = 50 µm; figs 106, 108 = 5 µm; fig. 107 = 10 µm.

DESCRIPTION:

Thickly encrusting to massive, growing on a substrate of serpulid tubes.

Surface: smooth, covered with 1-2 mm sized holes containing microcrustaceans. No apparent oscules.

Consistency: hard.

Colour: reddish brown in alcohol.

SKELETON:

Ectosomal: a crust of microscleres carried by bouquets of oxeas. The rounded shallow holes in which the microcrustacea are housed are covered by a crust of microscleres.

Choanosomal: internal structure radiate, fibrous. Radiating tracts of megascleres, are 100-250 µm in diameter, distances between them 80-100 µm. Microscleres are scattered between the tracts.

Spicules: oxeas, spinorhabds.

Oxeas: 336-*398*-526 µm by 8-*10*-12 µm.

Spinorhabds: microscleres with anisomorph rhabd (one end pointed the other blunt and spined) with sharply spined rays, 32-*39*-45 µm; "sigmodiscorhabd" growth stages present, 16-*25*-29 µm.

Etymology: the name refers to the association with the microcrustaceans.

Remarks: the young forms of the spinorhabds make it clear this species belongs to the revived genus *Sigmosceptrella*, differentiated from *Latrunculia* proper in having a sigmoid initial stage in the microscleres. This feature is shared by species of the revived genera *Diacarnus*, but these have their rays approximately of equal length while those of *Sigmosceptrella* are longer in the inner whorls than in the terminal whorls (KELLY-BORGES & VACELET 1995). No *Sigmosceptrella* species have been described from the East Pacific so far.

Polymastiidae Gray, 1867

Genus **Polymastia** Bowerbank, 1863

Type species: *Halichondria mammillaris* Johnston, 1842 by original designation.

Definition (emended from BOURY-ESNAULT *et al.* 1994): encrusting or spherical Polymastiidae with papillae and a cortex with a palisade of small tylostyles. Choanosomal skeleton of radial bundles of large tylostyles and free spicules. Spicules: tylostyles, styles or strongyloxeas. No microscleres.

Polymastia villosa n.sp. (Figs 109-112)

Material: Holotype USNM 41438 SEPBOP "Anton Bruun" 18B-795, E of Albemarle Isl., 00°37'S 90°51'W, 78 m, -1966, microscopical slides and fragments ZMA POR. 11231, MHNG 21020.

DESCRIPTION:

Globular hairy sponge with a single central papilla, attached to serpulid tubes. Size 28 x 32 x 28 mm. The papilla is smooth, conical, 8 mm long with an enlarged base of 7 mm in diameter and a pointed apex of 2 mm in diameter.

Surface: resembles, through protruding spicules, the pelt of a furred mammal. Mud and other foreign material is found captured between the spicules.

Consistency: firm, hard.

Colour: gray brown in alcohol.

SKELETON of the main body: in cross section five areas are visible: the outer pelt of protruding megascleres, points outward, sticking out 1400 μm from the surface; the surface palisade of small tylostyles, thickness 200 μm; a tangential layer of intermediate tylostyles, thickness 400 μm; an area free of spicules, thickness 250 μm; and a zone of confusedly reticulated packages of small tylostyles, thickness 400 μm. Through all this perpendicular tracts of large tylostyles, 200-350 μm in diameter, lying 400 μm apart, traverse from the centre of the body.

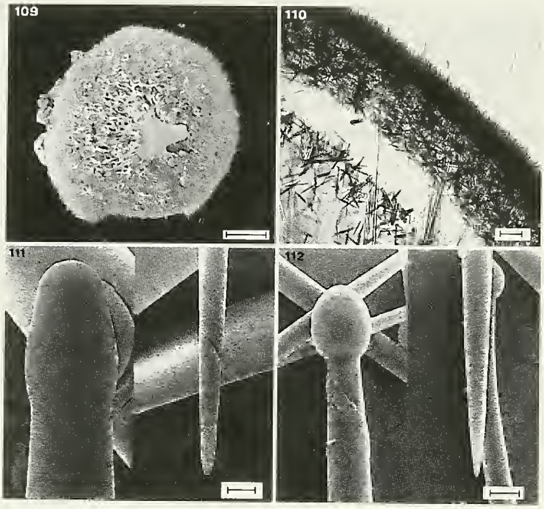
Spicules: tylostyles.

Ectosomal tylostyles of the palisade 123-*159*-209 by 4-5 μm.

Tylostyles of the subectosomal tangential layer 353-*503*-672 by 8-*11*-16 μm.

Tylostyles of the choanosomal packages 400 by 10 μm.

Tylostyles of the choanosomal tracts (including the protruding tylostyles): 1540-*1659*-3000 by 20-30 μm.



FIGS 109-112

Polymastia villosa n. sp. Stat. 18B-795 Albemarle Isl. 109. Holotype specimen, prominently hairy and with a single papilla. 110. Cross section of the surface, with surface palisade of small tylostyle, a free of spicule area, a confusely reticulated packages of small tylostyles, and the perpendicular tracts of large tylostyles. 111. Choanosomal subtylostyles. 112. View of the palisade tylostyles. Scales: fig. 109 = 10 mm; fig. 110 = 50 μm; fig. 111, 112 = 5 μm.

Etymology: the name refers to the hairy surface.

Remarks: the new species differs from the sympatric *Polymastia maeandria* Wilson, 1904, (holotype specimen USNM 8292), in the possession of a single papilla (many papillae in *P. maeandria*), and the hairy surface, (*P. maeandria* has a smooth surface). The largest tylostyles are much longer than those of *P. maeandria*. The new species is closest to *P. pachymastia* De Laubenfels, 1932, from California. De Laubenfels' description of this species is very inadequate, but we reexamined the type specimen USNM 22062, and found that spicule sizes and shapes are similar to those of our new species. However, the following differences were found: *P. pachymastia* forms flattened cushions with numerous blunt papillae (against the single conical papilla and globular growth form in *P. villosa*), and the smaller categories of tylostyles have less pronounced heads than those of *P. villosa*. *P. pachymastia* shows considerable similarities with *Sphaerotylus schoenus* (Sollas, 1882) from northern European waters. We have also examined the holotype (here designated) ZMB 3267, of *Polymastia isidis* Thiele, 1905, from Chile, which is distinct from our new species in the size of the largest tylostyles, which reach only 850 x 15 μm. That species was also reported from Kerguelen (BOURY-ESNAULT & VAN BEVEREN 1982) with larger tylostyles (up to 1600 μm) and with several papillae; this may turn out to be a separate species. *P. invaginata* Kirkpatrick (1908) from Antarctic and Sub-Antarctic waters (cf. photos in Boury-Esnault & Van Beveren 1982) has a shape similar to our new species, including the single central papilla, but it has a smooth surface.

Quasillina Norman, 1869

Type species: *Euplectella brevis* Bowerbank, 1861 by subsequent designation (Vosmaer 1885).

Definition (emended from Topsent 1900): massive Polymastiidae with or without stalk. Apical oscule. A cortex may be present. The only choanosomal skeleton consists of a subectosomal system of longitudinal and circumferential tracts. Megascleres styles to subtylostyles and strongyloxeas in two to three sizes.

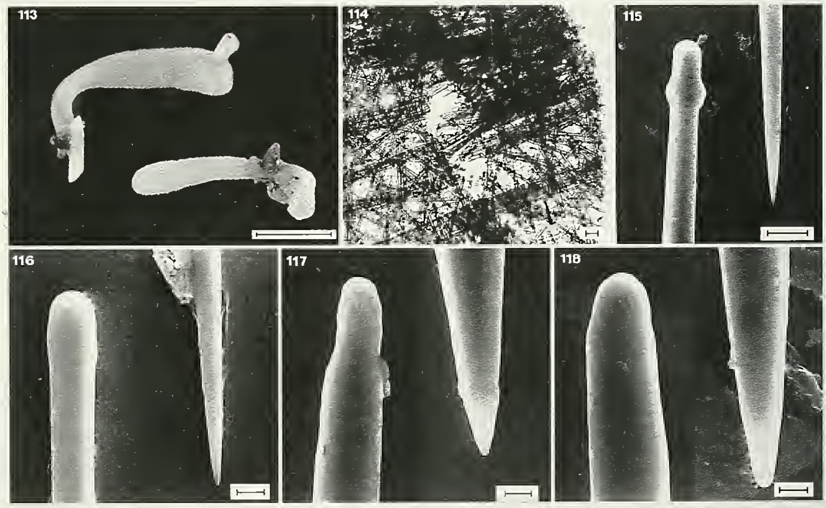
Quasillina translucida n. sp. (Figs 113-118)

Material: Holotype USNM 43163 SEPBOP "Anton Bruun" 18B-795, E of Albemarle Isl., 00°37'S 90°51'W, -1966, 78 m, attached to coarse sediment grains and small pebbles. Microscopical slides and fragments, MHNG 21021.

Paratypes: ZMA POR. 11232, 3 specimens and a fragment, same data as the holotype.

Description:

Elongate bladder-like fistules of 10-20 mm length, 4-8 mm in greatest width. The holotype has a small side-fistule near the apex. The specimens are all firmly



Figs 113-118

Quasillina translucida n. sp. Stat. 18B-795 E. of Albemarle Isl. 113. Holotype and paratype with a small side-fistule near the apex. 114. Strongly developed system of longitudinal tracts. 115, 116. Small ectosomal style to subtylostyle, sharply pointed. 117. Strongyloxea of the longitudinal tracts. 118. Strongyloxea of the circumferential tracts. Scales: fig. 113 = 10 mm; fig. 114 = 50 µm; fig. 115 = 5 µm; figs 116-118 = 2 µm.

attached to small pebbles, with a basal part that is narrower than the upper part but not forming a stalk. No oscule apparent, but suspected to be apical, and closed in preservation. Hollow, transparent, with a system of subdermal intercrossing longitudinal and perpendicular tracts clearly visible to the naked eye if held against the light.

Surface: optically smooth but microscopically hispid, rough to the touch.

Consistency: somewhat fragile, easily torn.

Colour: pale white in alcohol.

SKELETON:

Only an ectosomal and subectosomal skeleton is developed.

Ectosomal: a diffuse palisade of erect small styles to subtylostyles and tylostyles, rather spaced out and not forming a continuous surface crust. At the apex the small styles are crowded together to form a canopy covering and closing off a presumed terminal opening.

Subectosomal: the body is upheld by a strongly developed system of longitudinal tracts 60-120 µm in diameter, consisting of 5-20 huge strongyloxeas. The longitudinal tracts number 15-20 around the circumference of a specimen, they are occasionally anastomosing and lie at distances of 250-400 µm. Perpendicular to these there are thinner but more numerous circumferential tracts 50-80 µm in diameter consisting of intermediate sized strongyloxeas; many are single and oriented randomly.

Spicules: strongyloxeas in two sizes, styles to subtylostyles, tylostyles.

Long strongyloxeas of the longitudinal tracts, thin with a very narrow blunt end, 760-*1000*-1200 by 10-12 µm.

Short strongyloxeas of the circumferal tracts, relatively thick in the middle, likewise with very narrow blunt end, 400-*546*-650 by10-14 µm.

Small ectosomal styles, occasionally subtylostyles to tylostyles with a swollen or clearly developed tyle, uniformly thin over most of their length, but with an elongated sharply pointed end, the latter part frequently curved, 127-*160*-200 by 1-3 µm.

Etymology: the name refers to the transparent ectosome that allows to see the internal structure.

Remarks: this is the first record of the genus *Quasillina* from tropical latitudes. The new species is similar to Boreo-Arctic *Quasillina brevis* (Bowerbank, 1861) in most respects (cf. descriptions in e.g. VOSMAER 1885; DENDY 1888; TOPSENT 1900; KOLTUN 1966). However, specimens of that species are more definitely stalked, with a clear separation between a thin stalk and a wide main body. Also, no distinction is apparent between the sizes of strongyloxeas of the longitudinal and the circumferal tracts, although the overall size range is similar in both species.

Tethyidae Gray, 1867

Tethya Lamarck, 1815

Type species: *Tethya lyncurium* Linnaeus, 1767 by subsequent designation (SOLLAS 1888).

Definition: Spherical Tethyidae, never stalked, but may have basal rootlets. Cortex well developed, radiate skeleton of strongyloxeas, megasters (small spherasters and/or oxyspherasters) and micrasters (small and large euasters and oxyasters) found in ecto- and choanosome.

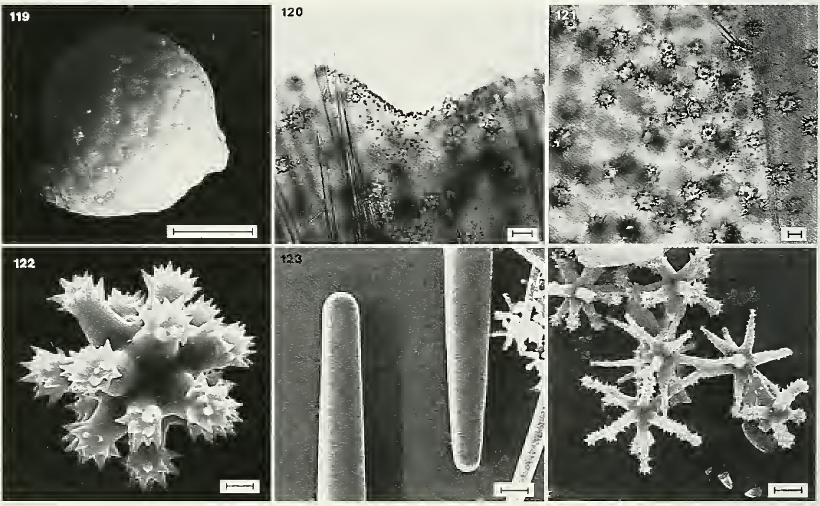
Tethya sarai n.sp. (Figs 119-124)

Material: Holotype USNM 37915, Bindloe Isl., Punta Espejo, intertidal, coll. W.D. Hope, 02-1978, microscopical slides and fragments, MHNG 21024

Paratypes: USNM 37921, Albemarle Isl., among mangrove, Estero Flores, coll. W.D. Hope, 1978; Indefatigable Isl., outer reef next to Turtle Bay, coll. R. Rofen, 17-05-1966, 0.5-1 m (25 specimens), microscopical slides and fragments ZMA POR. 11233, MHNG 18978; SEPBOP "Anton Bruun" 16-6610, Indefatigable Isl, 00°44'S 090°17'W, 19-05-1966. (5 specimens), microscopical slides and fragments ZMA POR. 11234, MHNG 21025; ZMA POR. 11235, MHNG 21023; 16-6696, Indefatigable Isl., 00°45'S 90°20'W, 0-1 m (1 specimen), microscopical slides and fragments ZMA POR. 11236, MHNG 21022; 18B-795D, Albemarle Isl., E coast, 00°34'S 90°56'W, 24-09-1966, intertidal (10 specimens), microscopical slides and fragments MHNG 21026.

DESCRIPTION:

Globular, relatively smooth, with low warts. Size up to 25 mm in diameter. No visible oscules. In cross section the thick cortical layer is clearly visible against the more yellowish interior.



FIGS 119-124

Tethya sarai n. sp. Stat. 18B-795D E of Albemarle Isl. 119. Holotype, globular specimen with low warts. 120. Thin, one layer crust of micrasters (tylasters). 121. Dense layer of spherasters with large sized asters of the outermost part, choanosomal megascleres tracts and spherasters. 122. Strongylasters with numerous arms. 123. Strongyloxea apices. 124. Oxyspherasters and tylasters. Scales: fig. 119 = 10 mm; figs 120-121 = 50 µm; fig. 122 = 2 µm; fig. 123 = 10 µm; fig. 124 = 5 µm.

Consistency: hard to compressible, somewhat variable among specimens.

Colour: cream in alcohol.

SKELETON:

In cross section the following zones may be distinguished: a thin one layer crust of micrasters (tylasters), a very thick (2-4 mm) very dense layer of spherasters, with the outermost parts containing on the average larger-sized asters than the innermost parts, but a clear separation into two zones is not found; there are frequent, but irregular aquiferous spaces in this zone. The cortex is set rather sharply apart from the choanosome, where micraster-like strongylasters or tylasters dominate; some spherasters are also scattered here. The choanosomal megasclere tracts form massive columns in the interior but fan out through the cortical layer of spherasters; diameter of the tracts near the surface 100-200 µm.

SPICULES:

Strongyloxeas, strongylasters/tylasters, micrasters/tylasters, oxyspherasters.

MEGASCLERES:

Strongyloxeas 920-*1224*-1500 by 20-*25*-30 µm.

MICROSCLERES:

Strongylasters/tylasters of the centre: 23 µm (up to 20 rays).

Micrasters/tylasters: 8-*10*-15 (10-12 rays).

Oxyspherasters in two size categories: 12-*16*-20 and 38-*67*-90 µm.

Ecology: in shallow water, among mangroves.

Etymology: named after Prof. Michele Sarà of the Genoa University in recognition of his exhaustive studies on the systematics of the genus *Tethya*.

Remarks: we have compared *Tethya sarai* n sp. with *T. deformis* Thiele, 1898, (MHNG 985932, specimen from Easter Island (I. Pascua)), species represented at Enochima and at Easter Island and with the holotype (ZMB 3269) of *T. papillosa* Thiele, 1905, from Calbuco, Chile, considered a synonym of *T. deformis* by TOPSENT 1918. Morphologically the three species are similar: globular and covered by small and low surface warts and without visible oscules. Differences in the microscleres structure and sizes are visible only under SEM (Table 10), but clearly show our material is a new species.

Order HALICHONDRIDA

Axinellidae Carter, 1875

Genus **Auletta** Schmidt, 1870

Type species: *Auletta sycinularia* Schmidt, 1870 by monotypy.

Definition: (from ALVAREZ *et al.* in press) Axinellidae specialized, hollow tubular, branching or cylindrical growth forms, with terminal oscules. Ectosome without specialized skeleton, but extra-axial choanosomal spicules may be piercing the surface, singly or in brushes. Choanosomal skeleton, with a basal condensed layer

TABLE 10

Spicule sizes reported for *Tethya deformis* Thiele, Japan and Easter Island and *Tethya papillosa* (Thiele), Chile, compared to *T. sarai* n. sp. Information from literature and ZMA and MHNG material. Measurements refer to length and wide (strongyloxeas) and to length and number of rays (strongylasters and micrasters).

Author/coll.	Locality	Strongyloxeas	Strongylasters	Micrasters
Tethya deformis	Enoshima	1300-1850 x 33	50	12
Desqueyroux-Faúndez, 1990	Easter Island	1405-1386 x 13-17	54	13.5
T. papillosa	Chile	1500 x 10-25	55-60	10-15
T. sarai n. sp. ZMA POR 11233 to 11236 MHNG 21022 to 21026	Galápagos	1224 x 25	23 / 20 rays	8-15 10-12 rays

of sinuous strongyles and styles, lining the inner tube wall and radial plumoreticulate extra-axial tracts of long styles/rhabdostyles of two sizes, embedded perpendicular to the axial skeleton; extra-axial tracts ascending towards the surface in longitudinal bands, united by abundant fibre and collagenous spongin, inteconnected by occasional uni- or aspicular fibres.

Auletta dendrophora Wilson, 1904 (Figs 125, 126)

Auletta dendrophora Wilson, 1904: 158, pl. 19, figs.4, 5. 7, pl. 25, fig. 2.

Material: SEPBOP "Anton Bruun" 18B-791C, off Seymour Isl., N of Indefatigable Isl., 00°26'S 90°20'W, 21.09.1966, 95 m. Microscopical slides and fragments: ZMA POR. 11247, MHNG 21031.

DESCRIPTION:

Fragment of a tube, 18 mm high, 11 mm in diameter, with a continous lumen of 3 mm in diameter over its whole.

Consistency: firm to compressible.

Surface: Covered by the terminal part of the fibres that form brushes of spicules projecting on the surface as an hispid layer.

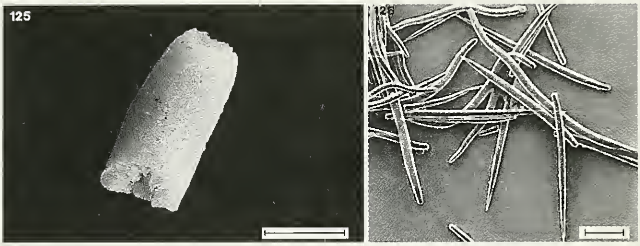
SKELETON:

Ectosomal: membranous, without specialized skeleton, pierced by the extra-axial spicules, then rough or goose-flesh appearance.

Choanosomal: internal wall of the tube formed by abundantly ramified longitudinal fibres of sinuous strongyles/oxeas.

Spicules: Styles and sinuous strongyles/oxeas.

Styles 1: 492-*671*-850 by 16-*20*-24 µm; styles 2: 131-*246*-336 by 8-*10*-16 µm.



Figs 125-126

Auletta dendrophora Wilson. Stat. 18B-791C Off Seymour Isl. 125. Fragment of tube. 126. Sinuous strongylo/oxeas and styles. Scales: fig. 125 = 25 mm; fig. 126.= 100 µm.

Sinuous strongyles/oxeas: 221-*417*-722 by 8-*13*-25 µm.

Ecology: depth 95 m.

Distribution: Galápagos Islands.

Remarks: we have compared our material with the holotype, USNM 8298 of *Auletta dendrophora* Wilson, from Galápagos.

Both our material and Wilson's are from the same depth. Morphology and spicule sizes closely match those of Wilson's specimen.

Phakellia Bowerbank, 1863

Type species: *Halichondria ventilabrum* Johnston, 1842 by original designation.

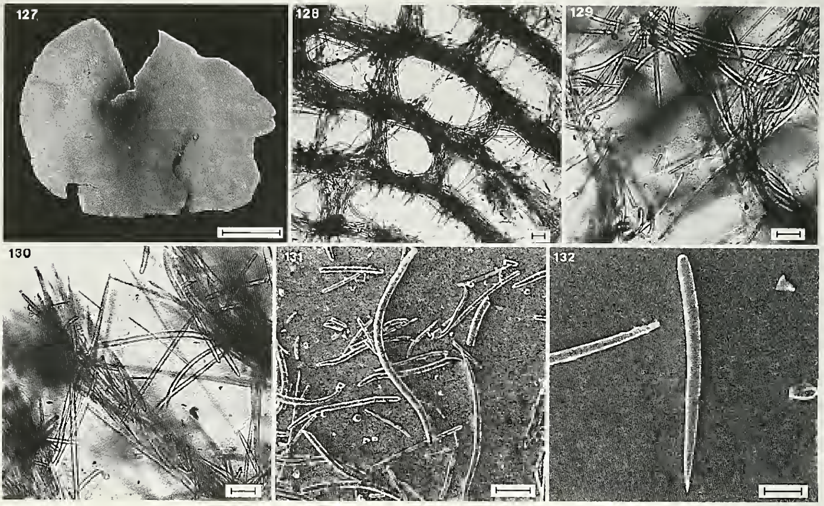
Definition (from Alvarez *et al.*, in press): compressed flabellate or cup-like forms predominate. Surface smooth or microconulose. Oscules often surrounded by stellate subectosomal drainage canals. Ectosomal skeleton membranous without spiculation, usually fleshy, often with extra-axial spicules protruding through the surface. Choanosomal axial skeleton as a dense mass of interwoven sinuous strongyles and styles or only strongyles, organized into multispicular-ascending and paucispicular transverse tracts, forming a compressed reticulation at the axis. Fibrous and collagenous spongin are sparse. Extra-axial skeleton of sparse plumose bundles or individual styles or oxeas, perpendicular to the axis, with or without transversely connecting megascleres. Microscleres absent.

Phakellia hooperi n.sp. (Figs. 127-132)

Material: Holotype USNM 39747 SEPBOP "Anton Bruun" 18B-791C, off Seymour Isl., N coast Indefatigable Isl. 00°26'S 90°20'W, 21.09.1969, 95 m. Microscopical slides and fragments ZMA POR. 11248, MHNG 21032.

DESCRIPTION:

Cup-shaped, 110 mm wide by 80 mm high, thickness of wall 4 mm near the base, 2 mm near the rim. Basal attachment lacking, rims show a few indentations. No visible oscules; outer surface distinctly punctate.



FIGS 127-132

Phakellia hooperi n. sp. Stat. 18B-791C Off Seymour Isl. 127. Holotype, cup-shaped specimen. 128. Rectangular neat system of interconnecting tracts. 129. Enlarged view of tracts of sinuous strongyles. 130. Surface brushes of ectosomal styles. 131. Sinuous strongyles. 132. Short styles of the choanosomal tracts. Scales: fig. 127 = 10 mm; figs 128-130 = 50 µm; fig. 131 = 100 µm; fig. 132 = 20 µm.

Surface smooth, uniformly structured, slightly hispid to the touch. Irregularly distributed round depressions (2-3 mm in diameter) are found on both surfaces, presumably left by epibiont barnacles or zoanthids.

Consistency: firm.

Colour: brown in alcohol.

SKELETON:

A neat rectangular system of longitudinal (diameter 150 µm) and interconnecting tracts (350 by 100 µm width), consisting of spongin fibres cored by 4-8 spicules in cross section. The meshes are very regular, elongately rectangular, 1000 by 350 µm. The tracts are formed by sinuous strongyles, short styles are placed at right angles to the tracts of strongyles. The tracts end at the surface in a neat system of meshes and brushes of short styles, occasionally by a single very long style, which protrudes far beyond the surface membrane, which is otherwise not provided with spicules.

SPICULES:

Styles and sinuous strongyles.

Short styles, of the tracts, and surface brushes, strongly curved near the base (almost like rhabdostyles): 98-*244*-394 by 4-*8*-12 µm

Long ectosomal styles: 799-*1257*-2000 by 4-*11*-16 µm.

Sinuous strongyles, curved several times in opposite directions: 328-*462*-648 by 12-*15*-20µm.

Etymology: named after John Hooper, Queensland Museum, Brisbane, in recognition of his prolific and outstanding work on the taxonomy and classification of the Demosponges.

Remarks: Wilson (1904) described *Phakellia lamelligera* from the Galápagos Islands. We re-examined the holotype USNM 8314 and found it to be quite dissimilar. In fact, this species is not a *Phakellia* because it lacks sinuous strongyles. The spicules include curved styles and oxeas and abundant trichodragmata; we propose to reassign this species to *Axinella*. No other *Phakellia* species are known from the East Pacific.

Desmoxyidae Hallmann, 1917

Halicnemia Bowerbank, 1864

Type species: *Halicnemia patera* Bowerbank, 1864 by original designation.

Definition (from van Soest 1987): Desmoxyidae encrusting, with a very hispid surface. Choanosomal skeleton: basal reticulation of longitudinal spicule tracts, consisting of styles and centrotylote smooth oxeas. Extra-axial styles or tylostyles are embedded and erect on this basal layer, protruding to and perpendicular to the surface. Specialized ectosomal acanthose, centrangulate or straight microxeas.

Halicnemia diazae n. sp. (Figs 133-138)

Material: Holotype: USNM 43165 SEPBOP "Anton Bruun" 18B-794A, James Isl., 00°12'S 90°50'W 23.09.1966, intertidal. Microscopical slides and fragments ZMA POR. 11249, MHNG 21033.

DESCRIPTION:

Massively encrusting, 5-10 mm thick, fragmented, largest fragment 30 by 10 mm.

Surface smooth, but slightly corrugated with subdermal grooves. No oscules apparent.

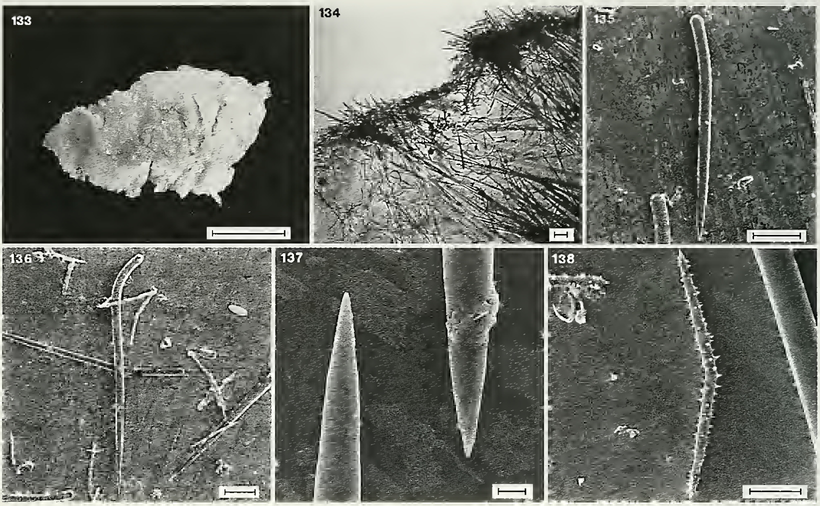
Consistency: compressible, crumbly.

Colour: whitish in alcohol.

SKELETON:

Ectosomal: a felted mass of mostly tangentially arranged acanthoxeas, carried by bouquets of oxeas.

Choanosomal: plumose-dendritic, consisting of thick tracts of long styles, erect on the substrate in bundles of two or three, surrounded by shorter rhabdostyles, ending at the surface in bouquets of oxeas. Tracts irregular, not visibly bound by any spongin. Acanthoxeas scattered throughout the choanosome.



Figs 133-138

Halicnemia diazae n. sp. Stat. 18B-794A James Isl. 133. Fragment of the holotype. 134. Surface skeleton with felted mass of acanthoxeas and oxea bouquets. 135. Long choanosomal style. 136. Smooth rhabdostyle. 137. Oxea of the surface bouquets. 138. Acanthoxea. Scales: fig. 133 = 10 mm; figs 134-136 = 50 µm; fig. 137 = 5 µm; fig. 138 = 20 µm.

Spicules:

Long styles, shorter (rhabdo-) styles, oxeas and acanthoxeas.

Long styles, smooth, most showing a smooth terminal tyle, mostly somewhat curved but not rhabdose, occasionally straight: 720-*800*-1300 by 8-*10*-28 µm.

Rhabdostyles: smooth curved strongly or occasionally almost straight (in the latter case not clearly differentiated from long styles) relatively thick, with a slight terminal or subterminal swelling, of quite wide ranging length: 280-770 by 10-23 µm.

Oxeas of the surface bouquets: smooth, straight, mostly centrotylote, often with mucronate apices: 375-520 µm by 5 µm.

Acanthoxeas: spined all over, with a sharp central angular bend: 65-115 by 2-5 µm.

Etymology: named after Maria Cristina Diaz in recognition of her valuable contributions to sponge systematics.

Remarks: so far the genus *Halicnemia* is not known from the tropical East Pacific; the nearest record is that of *Halicnemia patera* (Bowerbank) from British Columbia (Austin 1985). However, it is likely that several sponges described from the area under *Higginsia* are in fact members of *Halicnemia*. In shape and spiculation our new species is close to *Higginsia papillosa* Thiele, 1905 originally reported from Southern Chile. We have re-examined Thiele's material (Holotype ZMB 3283), and found clear differences in the shape of the shorter styles (not rhabdose in *H. papillosa*), and the sizes of the oxeas (up to 1 mm in *papillosa*) and acanthoxeas (100-170 μm in *papillosa*); the surface is papillated in *papillosa*. Thiele's species is here assigned to *Halicnemia* as it conforms to that genus (cf. VAN SOEST 1987) and not to *Higginsia* sensu HOOPER (1991). The species was subsequently recorded (without description) from Albemarle Island, Galápagos, by DE LAUBENFELS (1939). The identity of De Laubenfels' specimens remains to be determined; it may turn out to be our new species rather than Thiele's cold water species. A further similar species is the unnamed Desmoxyidae sp. A, described by GREEN & BAKUS (1994: 42) from California. In this species however, the main megascleres are tylostyles rather than styles and like *papillosa* the smaller ones are not rhabdose. The smaller styles are also much smaller (192-244 μm) than the smaller rhabdostyles of our new species. The oxeas may be up to 920 μm long, similar to *papillosa*. The yellow green *Higginsia* sp. sensu BAKUS & ABBOTT (1980) from intertidal California is also similar in form and spiculation, but no sizes and spicule shapes have been detailed by these authors.

Higginsia higginissima Dickinson, 1945 from California conforms to our concept of *Higginsia* with smooth oxeas as main megascleres.

The present material may be taken as further evidence for a close relationship between *Higginsia* and *Halicnemia* and between the halichondrid family Desmoxyidae and the Poecilosclerid families Raspailiidae and Rhabderemiidae. The similarity of the angulated acanthoxeas of both genera is here supported by a grade in skeletal architecture halfway between a strictly *Eurypon*-like architecture in *Halicnemia patera* and a strictly reticulate architecture in *Higginsia coralloides*. The new species has long styles surrounded by shorter styles, a feature also observed in *H. patera*, the plumose spicule bundles also observed in some *Higginsia* and surface bouquets of special oxeas reminiscent of a Raspailiid surface structure. The oxeas are centrotylote, a shape also found in *Halicnemia patera*. Future revision of these genera may well result in a union of the families Desmoxyidae and Raspailiidae.

Halichondriidae Vosmaer, 1887

Hymeniacidon Bowerbank, 1861.

Type species: *Hymeniacidon caruncula* Bowerbank, 1859 by subsequent designation (BOWERBANK 1864).

Definition: encrusting to fistulate Halichondriidae which have lost their oxeote spicules, retaining styles and stylotes. Choanosomal skeleton varies from halichondroid to disorganised with ascending spicules tracts. Ectosomal tangential skeleton is thin, membraneous, detachable, containing only styles or stylotes, less developed than in *Halichondria*. Most species with a characteristic fleshy consistency.

Hymeniacidon sinapium De Laubenfels, 1930

Hymeniacidon sinapium De Laubenfels, 1930: 26; DE LAUBENFELS 1932: 57, fig. 29; SIM & BAKUS 1986: 14.

Leucophloeus actites Ristau, 1978: 578, figs. 2d,3b,5c-d.

Material: USNM 37950, Nameless Isl., Stn 26A, coll. W.D. Hope, 01-02-1978, intertidal. Microscopical slides and fragments ZMA POR. 11250, MHNG 21034.

DESCRIPTION:

Thinly encrusting to low cushions, on barnacles, thickness 2-5 mm, lateral size up to 20 x 30 mm.

Surface: smooth, no apparent oscules.

Consistency: soft, easily torn.

Colour: orange in formalin and alcohol.

SKELETON: ectosomal tangential skeleton of intercrossing styles, easily detachable, because there are extensive subdermal lacunae. Choanosome largely confused, with large open spaces, with some vague tracts randomly oriented, carrying the surface skeleton. Many single spicules strewn in confusion. Spongin content low.

SPICULES:

Styles only, curved but otherwise perfectly shaped with long pointed ends and equidiametrical for most of the shaft length up to and including the blunt apex, in a large but continuous length variation, 148-*237*-312 by 4 µm.

Distribution: Galápagos Islands; Southern California.

Remarks: the descriptions of DE LAUBENFELS (1930, 1932) fit the present material precisely, (we have examined the holotype, USNM 37922, of *H. sinapium* De Laubenfels, 1930, from California), so the identification is made with confidence. The possibility that one of the species described by THIELE (1905), *H. rubiginosa* and *H. fernandezi* are conspecific with *H. sinapium* cannot be excluded since spicule measurements for these two species are: 325 by 7 µm and 300-340 by 7-10 µm.

Spongosorites Topsent, 1896

Type species: *Spongosorites placenta* Topsent, 1896 by original designation.

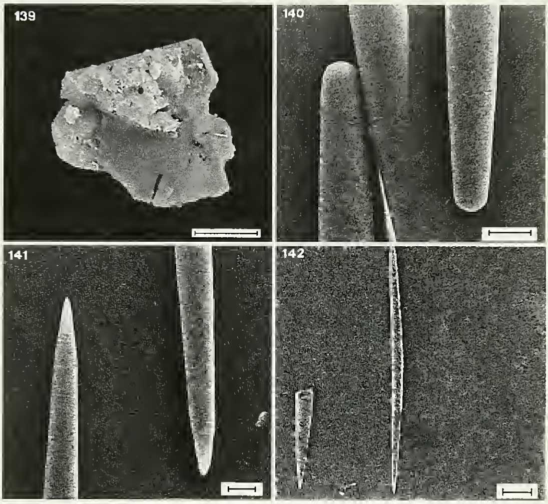
Definition (from VAN SOEST *et al.* 1990): Halichondriidae with a smooth, flaky crust of paratangentially arranged. relatively thin spicules and a choanosomal utterly confused skeleton, traversed by spongin-enforced tracts running more or less parallel to the surface. Most species show an aerophobic colour change from yellow to greyish brown or black.

Spongosorites smithae n.sp. (Figs 139-142)

Holotype: USNM 39721 SEPBOP "Anton Bruun" 18B-791C, off Seymour Island, N coast Indefatigable Isl., 00°26'S 90°20'W, 21-09-1966, 95 m.; SEPBOP "Anton Bruun" 18B-794E, James Isl. 00°12'S 90°52'W, 24.09.1966, 34 m. Microscopical slides and fragments ZMA POR. 11251, 21035, MHNG 21940, 21941.

DESCRIPTION:

Fragmented, the largest fragment of which is 30 x 30 x 10 cm, a flattened massive crust with a smooth surface and easily detachable crust of about 0.5 mm in thickness. It is partly encrusted by a *Haliclona* and no oscules are apparent.



FIGS 139-142

Spongosorites smithae n. sp. Stat. 18B-791C off Seymour Isl. 139. Fragment of the holotype, a massive crust. 140. Oxea with stylote modified apices. 141, 142. Oxeas 1 and 2. Scales: fig. 139 = 10 mm; fig. 140 = 10 µm; fig. 141 = 5 µm; fig. 142 = 20 µm.

Consistency: cheesy-compact. Several extensive galleries and holes are visible where the specimen has been cut-off.

Colour: a warm orange-brown in alcohol, interior somewhat lighter coloured.

SKELETON: at the surface there is a crust of irregularly crowded spicules, with a high proportion of the smallest size categories, thickness between 0.3 and 0.5 mm. Underneath there is an irregular system of spicule tracts intercrossing and anastomosing leaving irregular spaces in which loose, single spicules occur.

SPICULES:

Oxeas only, although some stylote modifications occur, mostly curved, occasionally angulated, rather abruptly pointed, in a great size range divisible in four size categories:

oxea I, 323-*364*-450 by 12-14-16 µm; oxea II, 220-*261*-300 by 10-12 µm; oxea III, 115-*160*-213 by 4-5-7 µm and oxea IV, 80-100 by 2 µm

Etymology: named after Kate P. Smith, assistant curator of the sponge collections of the National Museum of Natural History (Smithsonian Institution), Washington in recognition of her important activities behind the scenes.

Remarks: this is the first record of the genus from the East Pacific, although other species may hide under different generic names such as *Topsentia*. The (bio-) geographically closest record of a *Spongosorites* is that of the black-coloured *S. porites* De Laubenfels, 1949 from Onotoa in the Gilbert Islands (01°S 175°E) (DE

LAUBENFELS 1954). The black-colour undoubtedly is the result of a post-mortem colour change (POMPONI *et al.* 1991). We examined the holotype of that species (from the Yap Archipelago near the Philippines), USNM 22732, and found it to be quite different in skeletal architecture and spicule thickness. The surface crust in *S. porites* is much thinner, leaving distinct pore-fields, and the oxeas are only 4-5 µm in thickness in the larger spicules. There are three size classes of oxeas and their length is similar to that of the new species.

DENDY (1905) described three species of *Spongosorites* from Indian waters, but re-examination of his material is necessary to check whether these answer to the revised definition of *Spongosorites* given by VAN SOEST *et al.* 1990.

The new species is similar to some Caribbean *Spongosorites* (DIAZ *et al.* 1993), differing from them primarily in the differentiation of four size classes rather than the usual three (*S. arenatus*, *S. ruetzleri*, *S. siliquaria*) or two (*S. placenta*, *S. suberitoides*). The longest oxeas are also short compared to those of the other species excepting *S. suberitoides*.

Topsentia Berg, 1899

Type species: *Anisoxya glabra* Topsent, 1898 by monotypy.

Definition (from VAN SOEST *et al.* 1990): Halichondriidae with an ectosomal crust of compact, smaller ectosomal paratangential oxeas that form a brittle and rough microhispid surface. They may lose their ectosomal crust instead of which they have an utterly confused peripheral skeleton. Choanosomal skeleton a confused arrangement of spicules. Megascleres: oxeas of different sizes, twisted, bent spicules may be present. No microscleres.

Topsentia aff. **ophiraphidites** (De Laubenfels, 1934) (Figs 143-146)

Viles ophiraphidites De Laubenfels, 1934: 13.

Topsentia ophiraphidites; DIAZ *et al.* 1993: 290, figs 6, 12 (with further synonyms).

Material: USNM 43171 SEPBOP "Anton Bruun" 18B-794A, James Isl., 00°12'S 90°50'W, 23-09-1966, intertidal. Microscopical slides and fragments ZMA POR. 11252, MHNG 20771.

DESCRIPTION:

Fragments of a small massively encrusting sponge. Largest fragment 15 x 5 x 5 mm. Surface rough, uneven, microscopically hispid. No apparent oscules.

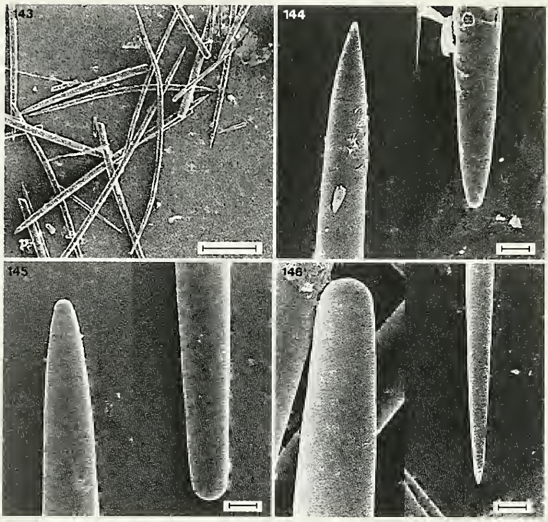
Consistency: firm to hard, brittle, fragile, crumbly.

Colour: brownish in alcohol.

SKELETON:

High spicule content; confused architecture, with vague spicule tracts and many single randomly oriented spicules. Near the surface, spicules tend to be arranged criss-cross forming a vague crust. Little or no spongin, not collagenous.

Spicules: curved oxeas, strongyloxeas and stylotes, in a great size range but difficult to divide into categories; representative sizes are: curved oxeas, 680-*803*-



FIGS 143-146

Topsentia aff. *ophiraphidites* (De Laubenfels). Stat 18B-794A James Isl. 143. Sinuous and straight oxeas. 144. Oxea. 145. Strongyloxea. 146. Stylote. Scales: fig. 143 = 200 µm; figs 144-146 = 10 µm.

1000 by 20 µm; straight oxeas, 599-*684*-795 by 8-*12*-16 µm; strongyloxeas, 467-*666*-820 by 8-*13*-16 µm; stylotes, 361-*637*-804 by 8-*14*-16 µm

Distribution: Galápagos Islands; if conspecific with *Viles ophiraphidites*, then amphi-American (Puerto Rico, Bahamas, S. Caribbean, Brazil).

Remarks: although it is unlikely, from a biogeographical and ecological point of view, that the intertidal Galápagos specimens and the deep-reef and fore-reef specimens from the Caribbean are conspecific, we cannot find morphological differences between these specimens. The diagnostic characters for *ophiraphidites* are admittedly vague and general, and the Galápagos specimen is small and fragmented, but the spicule sizes and form, including a proportion of sinuously curved smaller spicules, are similar to the extent that conspecificity has to be assumed for the time being.

It is not impossible that Californian records of *Oxeostilon burtoni* sensu DICKINSON (1945) (not: DE LAUBENFELS 1934) and *O. fernaldi* Sim & Bakus, 1986, are conspecific with the present material. If that would be demonstrated (on the basis of better material than now available), and if a specific difference with Caribbean *ophiraphidites* would be found in the future, then *fernaldi* would be available as a name for this species.

Order POECILOSCLERIDA

Suborder MICROCIONINA

Iophonidae Burton, 1929

Iophon Gray, 1867

Type species: *Halichondria scandens* Bowerbank, 1866, by subsequent designation (DENDY 1924)

Definition (from DESQUEYROUX-FAÚNDEZ & VAN SOEST 1996): Iophonidae with ectosomal skeleton of tylotes with spined heads and choanosomal isodictyal reticulation of smooth or spined styles, which may or may not be echinated by acanthostyles. Microscleres bipocilla and palmate isochelae.

Iophon lamella Wilson, 1904

Iophon lamella Wilson, 1904: 146, pl. 20, figs 3, 7-9, 12, 13, pl. 24, figs 2-4; DESQUEYROUX-FAÚNDEZ & VAN SOEST 1996: 15, figs 13-18, with synonyms.

Material: ZMA POR. 10977, MNHG 18808, Seymour Island, 95 m.

DESCRIPTION:

Small, irregularly lamellate fragments. Surface differentiated: one undulated and punctate and an opposite side with grooves, covered by a thin, easily removed membrane.

SKELETON:

Ectosomal: a palisade of scattered tylotes

Choanosomal: tight-meshed isotropical reticulation of spined styles and tylotes. Microscleres abundant.

SPICULES:

Megascleres: acanthostyles1, heavily spined, smooth tylotes with swollen spined apices.

Microscleres: spurred anisochelae 1 and 2, bipocilla strongly curved and one trilobate extremity.

Distribution: Galápagos Islands, West coast of Central America (Dickinson, 1945), Pacific coast of Southern California, Baja California.

Acarnus Gray, 1867

Type species: *Acarnus innominatus* Gray, 1867 by monotypy.

Definition (from VAN SOEST *et al.* 1991): massive, branching or encrusting Iophonidae, with ectosomal skeleton of scattered tylotes with spined heads, choanosomal skeleton consisting of an isodictyal, isotropic or anisotropic reticulation of styles and cladotylotes, arranged singly or in tracts of several spicules, which may or may not be echinated by acanthostyles and/or cladotylotes. Thinly, encrusting specimens with hymedesmioid skeleton, i. e. with styles or cladotylotes erected on the substrate. Cladotylotes in two categories, exceptionally in three or a single one. Microscleres up to three categories of toxas and chelae.

Acarnus peruanus van Soest, Hooper & Hiemstra, 1991 (Figs 147-154)

Acarnus peruanus van Soest, Hooper & Hiemstra, 1991: 70, text-fig. 5, pl. 1, fig. 5.

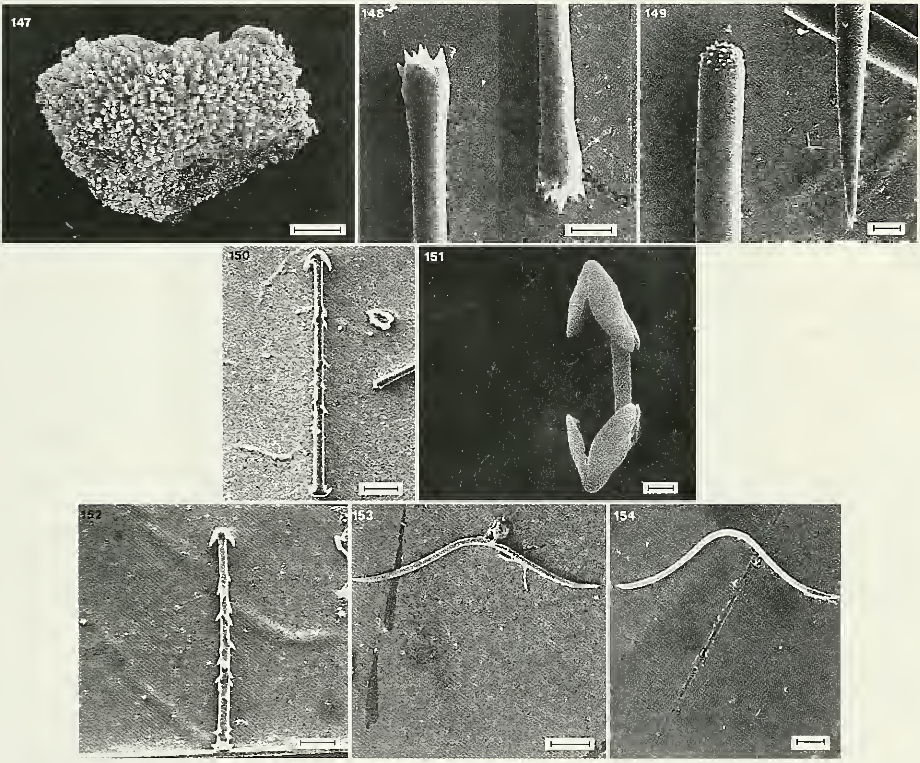
Material: USNM 43178 Albemarle Isl., Togus Cove, stat. 9, 02.1978, coll. W. D. Hope, 9 m. Microscopical slides and fragments ZMA POR. 11238, MHNG 21027.

DESCRIPTION:

Massive sponge, with rugose-conulose corrugated surface. No apparent oscules. Size of largest fragment 70 x 50 x 40 mm, partly encrusted by a black zoanthid.

Consistency: firm

Colour in formalin described as orange, in alcohol is pale beige.



FIGS 147-154

Acarnus peruanus van Soest, Hooper & Hiemstra. Albemarle Isl., Togus Cove, Stat. 9. 147. View of the studied specimen. 148. Ectosomal tylote microspined apices. 149. Choanosomal styles with microspined heads. 150, 152. Cladotylotes 1 and 2. 151. Palmate isochelae. 153. Toxas 1 and 3, 154. Toxa 2. Scales: fig. 147 = 10 mm; figs 148, 154 = 5 µm; fig. 149 = 10 µm; figs 150,153= 20 µm; fig. 151 = 10 µm; fig. 152 = 2 µm.

SKELETON:

Ectosomal: loose, irregular reticulation of styles arranged in bundles of two or three. Very little spongin. Nodes and individual styles echinated by acanthostyles and small cladotylotes.

SPICULES:

Ectosomal tylotes, choanosomal smooth styles, cladotylotes of two sizes, palmate isochelas and toxas.

MEGASCLERES: Tylotes with microspined heads: 172-*192*-262 by 3-4 µm;

Styles smooth but with microspined heads: 258-*393*-444 by 8-*10*-14 µm.

Cladotylotes 1 with spined shaft: 54-*73*-99 by 2 µm; cladotylotes 2: 102-*112*-122 by 3-5-6 µm.

MICROSCLERES: Palmate isochelae: 9-*13*-15 µm.

Toxas, thin, deeply curved, 33-*45*-53 µm;

Toxas thicker and longer with shallow curve: 70- *89*-123 µm

Distribution: Galápagos Islands; Peru.

Remarks: two discrepancies between the type specimen from Peru and the Galápagos specimen, are apparent: the length of the choanosomal styles (Peru: 244-371 µm) and the length of the thicker toxas (Peru: 188-211 µm). These differences are considered minor and not significantly different to discriminate between the two population at specific level.

Microcionidae Carter, 1875

Antho Gray, 1867.

Type species: *Myxilla involvens* Schmidt, 1864 by monotypy.

Definition (from HOOPER 1996): Microcionidae with ectosomal skeleton of auxiliary styles, choanosomal skeleton a basal or axial renieroid reticulation of acanthostyles, acanthostrongyles or "dumbell" spicules, with a secondary dendritic, plumose, plumoreticulate or echinating skeleton of smooth choanosomal styles arising from fibres (erect forms) or ascending upward from basal spongin (encrusting forms). Echinating acanthostyles present or absent. Microscleres include palmate isochelae, including modified forms (cleistochelae, pseudoarcuate), modified sigmoid isochelae (croca) and smooth or spined toxas of several forms.

Subgenus **Plocamia** Schmidt, 1870

Type species: *Plocamia gymnazusa* Schmidt, 1870 by subsequent designation (BURTON 1935).

Definition (from HOOPER 1996): with basal renieroid skeleton, composed predominantly of (acantho)strongyles or less commonly strongyles. Echinating acanthostyles overlap the main skeleton.

Antho (Plocamia) lithophoenix (De Laubenfels, 1927) (Figs 155-164)

Plocamia lithophoenix De Laubenfels, 1927: 263
Isociona lithophoenix; De Laubenfels, 1932: 99
[?Not: *Antho lithophoenix*; Sim & Bakus, 1986]

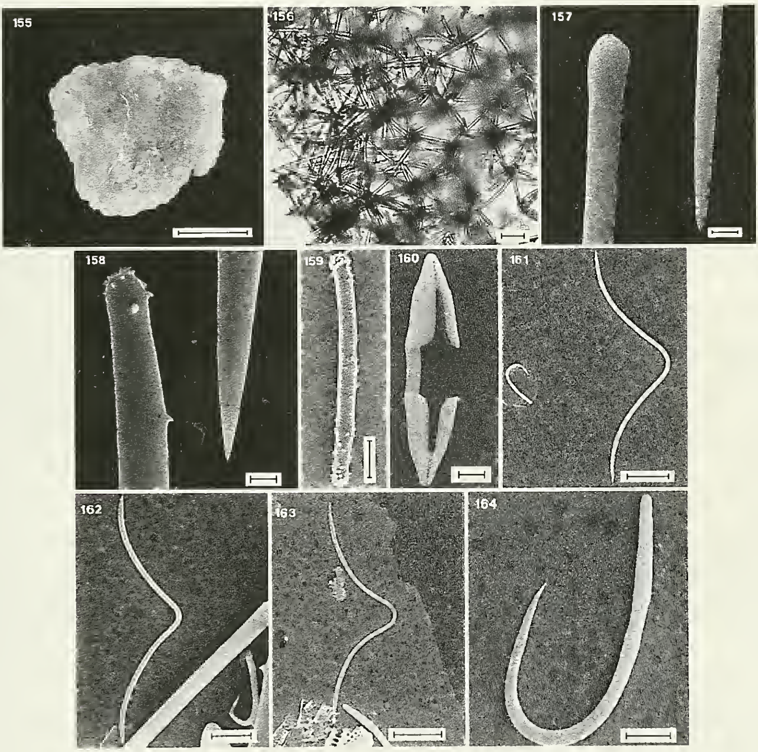
Material: USNM 37920, Gardner Isl., stat. 23, coll. W. D. Hope, 02. 1978, 22 m; microscopical slides and fragments, ZMA POR. 11239 , ZMA POR. 11240, MHNG 21028,; SEPBOP "Anton Bruun" 18B-794E, James Isl., 00°12'S 90°52'W, 24.09.1966, 34m, rock dredge. Microscopical slides and fragments, MHNG 21029, 20612.

DESCRIPTION:

Thinly to thickly encrusting, several mm in thickness, fragmented, fragments 26 x 16 x 6, 28 x 18 x 3, 8 x 7 x 2, 17 x 7 x 2, 12 x 9 x 1 mm.

Surface punctate, smooth or minutely conulose to corrugated. No obvious oscules. Consistency firm, fragile, crumbly.

Colour: pale reddish or yellow-beige in alcohol (presumably red in life).



FIGS 155-164

Antho (Plocamia) lithophoenix (De Laubenfels). Stat. 18 B-794E, Gardner Isl. 155. Fragment of specimen. 156. Choanosomal skeleton, isotropical reticulation of acanthostrongyles. 157. Ectosomal sutylostyles of the tangential skeleton. 158. Subectosomal styles, microspined apex. 159. Choanosomal acanthostrongyles with heavily spined apices. 160. Palmate isochelae. 161. Toxa 1, large and croca. 162. Toxa 2. 163. Toxa 3, small. 164. Croca. Scales: fig. 155 = 25 mm; fig. 156 = 50 µm; figs 157, 160, 164 = 2 µm; figs 158, 162, 163 = 5 µm; fig. 159 = 20 µm; fig. 161 = 10 µm.

Ectosomal skeleton: bundles of partly erect, partly tangential subtylostyles. Individual subectosomal styles protrude beyond the surface.

Choanosomal skeleton: isotropic reticulation of acanthostrongyles, echinated at the nodes by acanthostyles. The reticulation is quadrangular in cross section, triangular in tangential section, with sides consisting of one or two spicules. Meshes approximately 100 µm in size. A subectosomal area is free of choanosomal acanthostrongyles, but is crossed by long smooth styles standing erect on the choanosomal reticulation and piercing the ectosome.

SPICULES:

Ectosomal subtylostyles, subectosomal smooth styles, acanthostrongyles, acanthostyles, palmate isochelae, crocas and toxas.

MEGASCLERES:

Ectosomal subtylostyles, microspined at the head, in a wide size range, but not separable in two functional size categories: 120-320 by 1-3 µm.

Subectosomal styles, long, thick, smooth excepting the heads which are microspined: 280-320 by 14-20 µm.

Acanthostrongyles, entirely spined, but more heavily towards the apices: 82-*110*-125 by 6-*8*-10 µm.

Acanthostyles, entirely spined, but lightly so except at the head: 102-*130*-190 by 6-*7*-12 µm.

MICROSCLERES:

Palmate isochelae, 13-*16*-19 µm.

Toxas, gently curved, large size variation, divisible in three overlapping size categories, the largest of which has faintly but unmistakably roughened/spined ends: 220 by 3-4 (not in James Isl. specimen), 75-120 and 15-30 µm.

Crocas, (J-shaped or sigmoid isochelae), abundantly present in the Gardner Island specimen, were rare in the other specimen, size 8-10 µm.

Distribution: Galápagos Islands; California

Remarks: the description of the holotype of *Plocamia lithophoenix*, De Laubenfels, 1927, from California, differs in two aspects from the present material, the size range of the toxas, given as 23-110 µm and the crocas which were not reported. However, inspection of a slide of the holotype USNM 21460, revealed that a few of the toxas may reach 170 µm, clearly nearer the largest size found here. Given the large variability of the toxas, and the fact that we found the larger toxas only in one of the two specimens, this difference is not significant. Moreover, the roughened ends of the toxas were also found in the type slide of DE LAUBENFELS. Crocas [characteristic for the genus *Jia* De Laubenfels, 1930 which was synonymized with *Antho* by VAN SOEST & STONE (1986)] were also found in the type of *lithophoenix* after some searching. They are apparently variable in abundance, and were overlooked by DE LAUBENFELS (or considered contamination).

Antho species from neighbouring areas are: *A. inconspicua* (Desqueyroux, 1972), *A. karykina* (De Laubenfels, 1927), *A. igzo* (De Laubenfels, 1932), *A. karyoka*

(Dickinson, 1945), *A. illgi* (Bakus, 1966), *A. jia* (De Laubenfels, 1930) and *A. "mana-arensis"* sensu LAMBE 1894. All these species differ distinctly from *A. (P.) lithophoenix.*

Raspailiidae Hentschel, 1923

Aulospongus Norman, 1878

Type species: *Halyphysema tubulatus* Bowerbank, 1873 by original designation.

Definition (from HOOPER 1991): Raspailiidae cup-shaped, lobate and cylindrical growth forms, composed of fused, shaggy fibre bundles. Choanosomal axial skeleton not condensed, composed of long plumose, partially fused spongin fibres cored by smooth rhabdostyles, diverging in the periphery, ectosome without any specialized spicules or skeletal structure, echinating acanthostyles have smooth rhabdose bases, with spined points, or sometimes they are entirely spined; rhaphide microscleres present or absent.

Aulospongus galapagensis n.sp. (Figs 165-168)

Material: Holotype USNM43173 SEPBOP "Anton Bruun" 18B-795, E of Albemarle Isl., 00°37'S 90°51'W, -1966, 78 m. Microscopical slides and fragments, ZMA POR. 11241, MHNG 20614.

DESCRIPTION:

Small branch fragment, 15 mm long, 50 mm diameter, with hispid surface due to single long styles protruding far out from the surface.

Consistency: stiff.

Colour: beige in alcohol.

SKELETON:

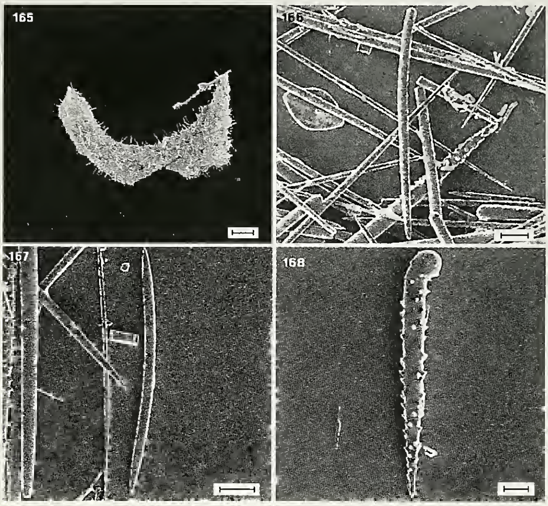
Typical raspailiid surface bouquets, with a central longer style,surrounded by small oxeas and styles. The skeleton of the interior of the branch is a central solid column of aligned long styles, and this column is profusely echinated by acanthorhabdostyles and smooth tylostyles. There is no reticulation.

SPICULES:

Long styles, small styles, oxeas, acanthorhabdostyles and smooth curved tylostyles.

Long styles of the surface bouquets 1300-1700 by 20-45, often strongylostyle modifications; spicules of the central column predominantly styles, probably of the same category as those of the surface but in a larger range of size and form, strongylostylote, strongylote and even occasionally oxeote modifications occur, 400-1700 by 20-45 µm.

Small styles and oxeas of the surface bouquets are essentially the same spicule type, but the styles have one end blunt, and are technically strongyloxeas, both types are united under the name anisoxeas by HOOPER (1991), size 450-550 by 8-15 µm.



FIGS 165-168

Aulospongus galapagensis n. sp. Stat. 18B-795. E. of Albemarle Isl. 165. Holotype, a small branch fragment. 166. General view of spicules, with style and acanthorhabdostyle. 167. Oxea of the surface bouquets and strongyloxea. 168. Echinating acanthorhabdostyle. Scales: fig. 165 = 20 mm; figs166, 167 = 50 µm; fig. 168 = 20 µm.

Echinating acanthorhabdostyles spined only in the lower half, although occasionally there are some spines in the upper half and on the tyle, spines curved towards the rounded end, 170-320 by 15-30 µm;

Echinating smooth tylostyles, curved, probably the same spicule category as the acanthorhabdostyles, 250-280 by 8-10 µm.

Etymology: named after the type locality.

Remarks: the present material is very close to Californian *Aulospongus hyle* (De Laubenfels, 1930 as *Hemectyon*). Points of difference are the shape (frondose in *hyle*), and the apparent lack of ectosomal long styles causing a smooth surface instead of the strongly hispid surface of our new species. Spicule sizes and categories are similar in both, and conspecificity is not entirely impossible.

Another East Pacific species with similar spicules is *Aulospongus cerebella* (Dickinson, 1945 as *Heterectya*); however this is a massively encrusting sponge without special surface bouquets. A possible third species of *Aulospongus* close to our new species is Dickinson's *Hemectyon hymani*. The spiculation includes "raphides" of 150 by 2 µm, which may be equivalent to the anisoxeas of the surface bouquets. If that is the case, then the size of these is clearly different from those of the new species. The apparent close relationship in spicule categories and sizes found between *A. galapagensis* n. sp. and *A. hyle* forms a strong support for HOOPER'S (1991) decision to unite the genera *Aulospongus* and *Hemectyonilla*, as both would have had to be assigned to these different "genera" on the basis of their skeletal architecture.

Suborder MYXILLINA

Myxillidae Topsent, 1928

Myxilla Schmidt, 1862

Type species: *Halichondria rosacea* Lieberkühn, 1859 by subsequent designation (RIDLEY & DENDY 1887).

Definition (from DESQUEYROUX FAÚNDEZ & VAN SOEST 1996): Myxillidae with ectosomal spicules variably mucronate, strongylotylote or tornote, frequently with one or a few prominent spines on the apices. Choanosomal spicules stylotes, with or without spination. Microscleres anchorate chelae spatulate and/or unguiferate and sigmas.

Subgenus **Myxilla** Schmidt, 1862

Myxilla (Myxilla) mexicensis Dickinson, 1945

Myxilla mexicensis Dickinson, 1945: 18, pl. 24, figs 47-48, pl. 25 figs 49-50; DESQUEYROUX-FAÚNDEZ & VAN SOEST 1996: 27, figs 39-53.

Material studied: USNM 37918-19, ZMA POR. 10978-79, MNHG 18958-61, from Kicker Rock, Albemarle Isl., James Isl., and Indefatigable Isl, 18-60 m.

DESCRIPTION:

Tubiforme sponge with the basal part slightly enlarged. Surface strongly tuberculate and irregular. Choanosome with large open spaces and canals. Pores irregularly scattered in surface depressions.

SKELETON:

Ectosomal: a perpendicular compact palisade of tylotornotes and free microscleres.

Choanosomal: a tight meshed isotropic reticulation of strongly spined styles, abundant microscleres specially sigmas.

SPICULES:

Megascleres: strongly spined styles, slightly bent, tylotornotes straight, regular diameter and swollen spined apices.

Microscleres: anchorate spatuliferous isochelas 1 and 2, morphologically identical.

Distribution: Galápagos Islands; Southern California.

Tedaniidae Ridley & Dendy, 1886

Tedania Gray, 1867

Type species: *Reniera digitata* Schmidt, 1862 by subsequent designation (KOLTUN 1959).

Definition (from DESQUEYROUX FAÚNDEZ & VAN SOEST 1996): Tedaniidae possessing morphologically distinct ectosomal and choanosomal megascleres. The type species has microspined tylotes as ectosomal spicules and smooth styles as choanosomal spicules.

Subgenus **Tedania** Gray, 1867

Tedania (Tedania) galapagensis Desqueyroux-Faúndez & van Soest, 1996

Tedania (Tedania) galapagensis Desqueyroux-Faúndez & Van Soest, 1996: 53, figs 99-104.
Material: ZMA POR. 11264, MNHG 18975, Albemarle Isl., 78 m.

DESCRIPTION:

Fragil, very soft massive sponge, with smooth surface covered by a thin, non detachable membrane. Several small oscules. Aquiferous canals visible under the membrane.

SKELETON:

Ectosomal: palisade of tylote bundles, partially included in the membrane, abundant onychaetes.

Choanosomal: tight meshed reticulation of short longitudinal tracts of smooth styles connected by tylotes and abundant free onychaetes.

Spicules: styles, tylotes, onychaetes.

MEGASCLERES:

Styles, thin, smooth, slightly curved.

Smooth tylotes with oval microspined apices.

MICROSCLERES: onychaetes strongly spined.

Distribution: Galápagos Islands.

Anchinoidae Topsent, 1928

Genus **Phorbas** Duchassaing & Michelotti, 1864

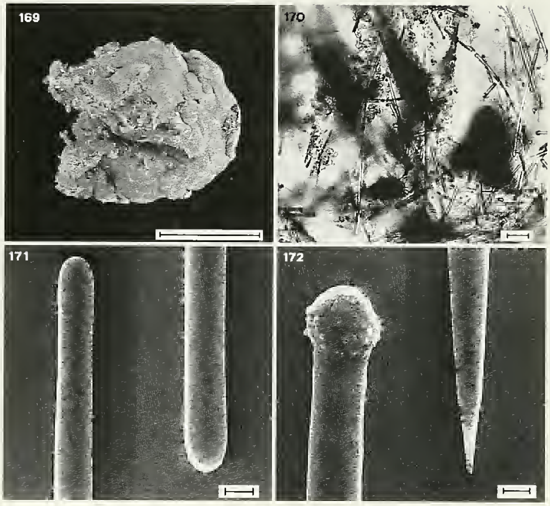
Type species: *Phorbas amaranthus* Duchassaing & Michelotti, 1864 by subsequent designation (DE LAUBENFELS 1936).

Definition (emended from VOULTSIADOU-KOUKOURA & VAN SOEST 1991): Anchinoidae in which the styles composing the choanosomal plumose or plumo-reticulate tracts, if present, are heavily spined acanthostyles. Occasionally the coring acanthostyles are completely replaced by the diactinal smooth spicules. Echinating styles are likewise, heavily spined. Microscleres arcuate isochelae and sigmata.

Phorbas californiana (De Laubenfels, 1932) (Figs 169 -172)

Myxilla versicolor californiana De Laubenfels, 1932: 81, fig. 46;
Podotuberculum hoffmani Bakus, 1966: 505, fig. 23, pl. II fig. c.

Material: USNM 43176 SEPBOP "Anton Bruun" 18B-794E, James Isl., 00°12'S 90°52'W, 24-09-1966, 34 m, encrusting on rock. Microscopical slides and fragments ZMA POR. 11242, MHNG 21030, 21944.



FIGS 169-172

Phorbas californiana (De Laubenfels). Stat. 18B-794 E James Isl. 169. Massively encrusting fragment. 170. Choanosomal network. 171. Anisotylote. 172. Style with acanthose head. Scales: fig. 169 = 20 mm; fig. 170 = 50 µm; figs 171, 172 = 5 µm.

DESCRIPTION:

Massively encrusting, about 10 mm thick, largest fragments 20 x 10 mm.

Surface: smooth but warty, presumably because pore-sieves were contracted in preservation. No obvious oscules. A thick ectosomal layer is easily detachable. Consistency: compressible, moderately firm.

Colour: Surface layer greyish brown in alcohol. Choanosome more reddish brown.

SKELETON:

Ectosomal: a closely arranged palisade of anisotylotes to anisostrongyles. Part of the them are paratangential and form a thick crust on the surface.

Choanosomal: distinctly developed plumose tracts lying at distances of 200-350 µm, here and there anastomosing, 50-70 µm in diameter, made up of anisostrongyles and styles, with progressively more styles towards the interior of the sponge. Tracts are loosely and not very abundantly echinated by styles.

Spicules: anisotylotes to anisostrongyles, styles; no microscleres.

Anisotylotes, occasionally true tylotes, occasionally aniso-strongyles, making up the surface palisade and filling up the peripheral parts of the choanosomal tracts, 202-*240*-310 by 3-6 µm.

Styles, curved, with acanthose heads, sometimes with a few spines along the upper part of the shaft, rarely entirely smooth, echinating and filling the choanosomal tracts, 243-*272*-304 by 6-10 µm.

Distribution: Galápagos Islands; California.

Remarks: the holotype of *Myxilla versicolor californiana* (USNM 21474), from California, was compared with the present material and it was similar in structure; spicule sizes were smaller than ours (anisotylotes 240 by 4-8, styles 250-265 by 8-12 µm), but were otherwise similar. Microscopic slides of the paratype of *Podotuberculum hoffmani* (BMNH 1964:12:1:4), from Eagle Point, San Juan Island, Washington, were also examined, and they as well as the description, match in all aspects, including the surface tubercles. No other *Phorbas* species have been reported from the East Pacific. The anisotylotes of our material often are nearly perfect tylotes, but invariably one head is slightly more extended than the other. In the absence of isochelae the present species approaches *Phorbas mercator* (Schmidt, 1868 as *Suberotelites*) from the Mediterranean; however, this has entirely spined short acanthostyles quite like other species of *Phorbas*. With VOULTSIADOU-KOUKOURA & VAN SOEST 1991, we consider the loss of chelae an unlikely synapomorphy for *Phorbas*-like sponges and consequently the genera *Suberotelites* and *Podotuberculum* are considered synonyms of *Phorbas*.

Coelosphaeridae Hentschel, 1923

Lissodendoryx Topsent, 1892

Type species: *Tedania leptoderma* Topsent, 1889 by subsequent designation (TOPSENT 1894).

Definition (from HOFMAN & VAN SOEST 1995): Coelosphaeridae with ectosomal skeleton of smooth tylotes tangentially or in spicule bundles. Choanosomal skeleton arranged in a renieroid reticulation of single spicules or paucispicular tracts: smooth or spined styles, occasionally oxeas, without echinating spicules. Microscleres include arcuate isochelae and sigmata.

Lissodendoryx albemarlensis n.sp. (Figs 173-178)

Lissodendoryx isodictyalis Dickinson, 1945: pl. 28, fig. 56, pl. 29 figs 57-58, pl. 30 figs 59-60.

Material: Holotype: USNM 43169 SEPBOP "Anton Bruun" 16-66142, Albemarle Isl., W coast, 00°14'S 091°26'W, 25-05-1966, depth not recorded. Microscopical slides and fragments ZMA POR. 11243, MHNG 20596.

DESCRIPTION:

Small cushion, fragmented, largest approximately 10 x 10 x 10 mm.

Surface coarsely punctate to almost clathrate. No discernable oscule, but many smaller apertures visible.

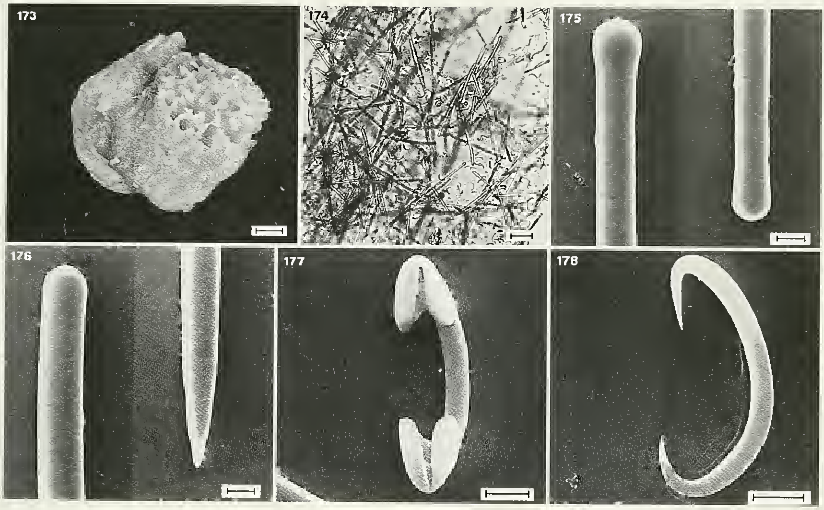
Consistency: rather firm, fragile, crumbly.

Colour: pale beige in alcohol.

Ectosomal skeleton: where present, it consists of tangential and paratangential bundles of tylotes.

Choanosomal skeleton: isotropic, but irregular, with squarish meshes enclosed by 1-5 styles per side. Microscleres abundant. Little spongin.

Spicules: tylotes, styles, arcuate isochelae and sigmas.



FIGS 173-178

Lissodendoryx albemarlensis n. sp. Stat. 16-66142 0°14'S 091°26'W. 173. Holotype, small cushion fragment. 174. Isotropic to irregular choanosomal network. 175. Apices of tylote. 176. Apices of short and fat style. 177. Arcuate isochelae. 178. Sigma. Scales: fig. 173 = 50 mm; fig. 174 = 50 µm; figs 175-178 = 5 µm..

MEGASCLERES:

Ectosomal tylotes, short and fat, with distinct tyles, entirely smooth, 107-*139*-170 by 5 µm.

Choanosomal styles, short and fat, slightly curved, often with slightly developed tyle, entirely smooth, 123-*157*-190 by 4-8 µm.

MICROSCLERES:

Arcuate isochelae, in a single very uniform size: 16-26 µm.

Sigmas likewise in a single very uniform size: 16-26 µm.

Distribution: Galápagos Islands; Southern California; possibly northward up to Vancouver Island.

Remarks: DICKINSON'S (1945) description of *L. isodictyalis* from Lower California shows no discrepancies with our material. *L. isodictyalis* (Carter, 1882) is a Caribbean sponge with two size categories of chelae and sigmas. All other records from the East Pacific of *Lissodendoryx* material similar to our specimen mention the occurrence of partly spined styles. In view of the variation of this feature (cf. VAN SOEST 1984 in *L. isodictyalis*) this fact alone is not a good specific character. A species similar to our material and from a nearby area is *L. noxiosa* De Laubenfels, 1930. We compared the holotype of this species (USNM 21467), from California, with our material and found them to be generally similar in architecture and spicule sizes, but there were two obvious differences: all styles in *L. noxiosa* had spines on their heads (but see above remark), and there are two distinctly different chelae categories, 28-33 and about 15-18 µm; the latter are not mentioned in DE LAUBENFELS' descriptions. BAKUS (1966) synonymized DE LAUBENFELS' *L. noxiosa* with LAMBE's (1895) *Myxilla firma*, and he may be right: Lambe records chelae in two size categories (52 and 13-19 µm). BAKUS' (1966) San Juan material appears close to the Californian material in spicule sizes.

Suborder MYCALINA

Guitarridae Burton, 1929

Genus **Guitarra** Carter, 1874

Type species: *Guitarra fimbriata* Carter, 1874 by monotypy.

Definition (emended from BERGQUIST & FROMONT 1988): Guitarridae with ectosomal brushes of megascleres and choanosomal reticulation. Megascleres are oxeas or stylote derivations. Microscleres include placochelae, biplacochelae, spined sigma-like microscleres, and peculiar microscleres with spines probably derived from palmate isochelae.

Guitarra abbotti Lee, 1987 (Figs 179-184)

Guitarra abbotti Lee, 1987: 465, figs 1-13.

Material: USNM 43175 SEPBOP ,"Anton Bruun" Stat. 18B-795, E of Albemarle Isl., 00°37'S 90°51'W, -1966, 78 m. Microscopical slides and fragments ZMA POR 11245, MHNG18822.

DESCRIPTION:

Elongated-globular sponge, size 40 x 15 x 10 mm. Surface irregularly crinkled, pierced by spicule brushes, but generally smooth. One larger (3 mm) and one smaller oscule, both somewhat sunken, on the upper side.

Consistency: compressible, soft, fragile.

Colour: in alcohol beige.

SKELETON:

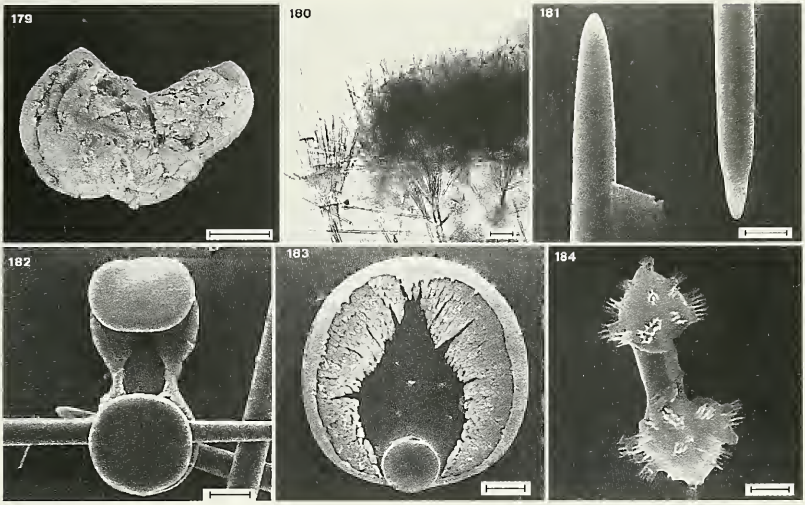
Ectosomal: Terminal part of choanosomal spicule tracts may penetrate the membrane and form a loose surface spicule network.

Choanosomal: rather confused, in places plumose, in other areas more alveolate, with thick spicule tracts, 50-70 µm in diameter, consisting of 10 or more spicules, criss-crossing in an ill-defined reticulum forming irregular meshes of 200 - 400 µm.

Spicules: oxeotes, placochelae, biplacochelae and spined isochelae.

MEGASCLERES:

Oxeotes, anisodiametrical, with one end often more elongate than the other, size, 350-455 by 5-10 µm; in the ectosomal bouquets smaller oxeotes of 200-250 by 3 µm occur.



FIGS 179-184

Guitarra abbotti Lee. Stat. 18B-795 E. of Albemarle Isl. 179. Fragment of a massive specimen. 180. Cross section with surface view, spicule tracts and ectosomal bouquets. 181. Oxeote apices. 182. Placochelae. 183. Biplacochelae. 184. Spined isochelae. Scales: fig. 179 = 50 mm; fig. 180 = 50 µm; figs 181, 183 = 5 µm; fig. 182 = 10 µm; fig. 184 = 2 µm.

MICROSCLERES:

Placochelae in two size categories: 55-75 by 25-30 µm and 30-35 by 12-15 µm.
Biplacochelae in only one size category: average 27 µm.
Spined isochelae average 12 µm.

Distribution: Galápagos Islands; Northern California.

Remarks: the present material is similar to *Guitarra abbotti* Lee, 1987, differing slightly in the size of the oxeas (250-396 µm in Lee's material) and the length of the large placochelae (64-100 µm in Lee's (1987) material). *G. abbotti* was originally described from nearby northern California (38°N 123°W). If our specimen is indeed conspecific, then we have to assume that *G. abbotti* is sympatric with *G. isabellae* Lee, 1987, described from Tagus Cove, Isabela Island (=Albemarle Isl.), Galápagos, at 82 m. The two species differ rather distinctly in the presence of sigmas and the absence of spined isochelae in *G. isabellae*. We have to accept these differences as valid species criteria until further research on variability of such characters has been completed.

Mycalidae Lundbeck, 1905

Mycale Gray, 1867

Type species: *Hymeniacidon lingua* Bowerbank, 1863 by subsequent designation (THIELE 1903).

Definition (from Hajdu & Desqueyroux-Faúndez 1994): Mycalidae with anisochelae.

Subgenus **Carmia** Gray, 1867

Type species: *Hymeniacidon macilenta* Bowerbank, 1866 by subsequent designation Topsent 1924.

Definition: (From Bergquist & Fromont 1988) choanosomal skeleton of dendritic-plumose tracts of styles or subtylostyles, extending to the surface and sometimes expanded slightly into brushes. No special surface skeleton.

Microscleres are anisochelae, sigmas and toxas may be present.

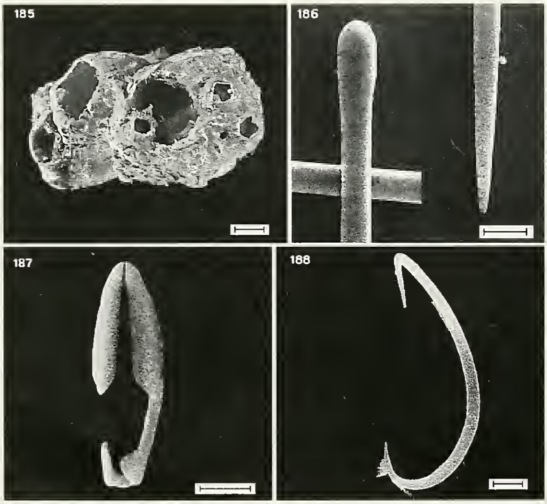
Mycale (Carmia) cecilia De Laubenfels, 1936 (Figs 185-188)

Mycale cecilia De Laubenfels, 1936b: 447, fig. 41
Mycale microsigmatosa Green & Gomez, 1986: 284, figs 37-40

Material: USNM 36614, Albemarle Isl., Kicker Rock, stat. 17, 02-1978, encrusting barnacles on a steep vertical slope, 23 m. Microscopical slides and fragments ZMA POR. 11246, MHNG 18988, 21946, 21954.

Description:

Thinly encrusting on giant barnacles, 2-5 mm in thickness, indefinite lateral expansion. Surface irregular, lumpy, in places conulose, but this is caused by



Figs 185-188

Mycale (Carmia) cecilia De Laubenfels. Stat. 17. Kicker Rock. 185. Thinly encrusting specimen on giant barnacles. 186. Straight mycalostyles (subtylostyle). 187. Narrow anisochelae with long median alae. 188. Thin, twisted sigma. Scales: fig. 185 = 10 mm; figs 186-188 = 5 µm.

protruding hydroid stalks. Partly overgrown by a compound tunicate. Oscules few, small, up to 3 mm in diameter, slightly raised above the surface.

Consistency: soft, crumbly, easily damaged.

Colour: light beige in alcohol.

SKELETON:

Ectosomal: the organic dermis is carried by bouquets of diverging megascleres.

Choanosomal: plumose-dendritic skeleton, with well-defined spicule tracts diverging dichotomously towards the surface, rarely anastomosing, 100 µm in diameter (25 spicules across) at the base, thinning out to 30 µm (3-4 spicules across) just below the surface. Microscleres abundant in all parts of the sponge.

Spicules: subtylostyles, anisochelae, sigmas.

MEGASCLERES:

Subtylostyles ("mycalostyles") straight, with clearly developed neck, 166-*230*-260 x 2-4 µm.

MICROSCLERES:

Anisochelae, with characteristic narrow shape and long median alae: 10-*14*-20 µm. possibly dividable in two categories, but morphologically similar;

Sigmas, thin, twisted: 24-*30*-35 µm.

Distribution: Galápagos Islands; Pacific coasts of Mexico and Panama.

Remarks: In spiculation, the present material conforms closely to Caribbean *M. microsigmatosa* (cf. VAN SOEST 1984; Hajdu, pers. comm.) and to *M. microsigmatosa* Green & Gomez, 1986 from Pacific Mexico, with spicule sizes and form quite similar. DE LAUBENFELS (1936b) described *M. cecilia* from Pacific Panama as a separate species, but its description and the form of the figured spicules is strongly reminiscent of *M. microsigmatosa*, as well. The only difference is the alleged occurrence of two size categories of anisochelae, viz. 12-15 and 22-25 µm, of which De Laubenfels admits the existence of intermediates. Similar size ranges were found in our material, but a clear gap in the size frequency is absent. The *microsigmatosa* type of sponge occurs in many parts of the tropical oceans. However, the existence of two separate species on both sides of the isthmus of Panama, may be confirmed and accordingly we propose to retain the name *M. cecilia*.

Order HAPLOSCLERIDA

Phloeodictyidae Carter, 1882

Genus **Oceanapia** Norman, 1869

Type species: *Desmacidon robusta* Bowerbank, 1866 by subsequent designation (DE LAUBENFELS 1936).

Definition (emended from VAN SOEST 1980): Phloeodictyidae with a spongin-enforced tangential ectosomal crust and long aquiferous fistules reinforced by an irregular isotropically meshed reticulation of spicule tracts bound by spongin.

Choanosomal skeleton with multispicular tracts of spicules, and an isotropic skeleton of single spicules. Microscleres may include sigmas and/or toxas.

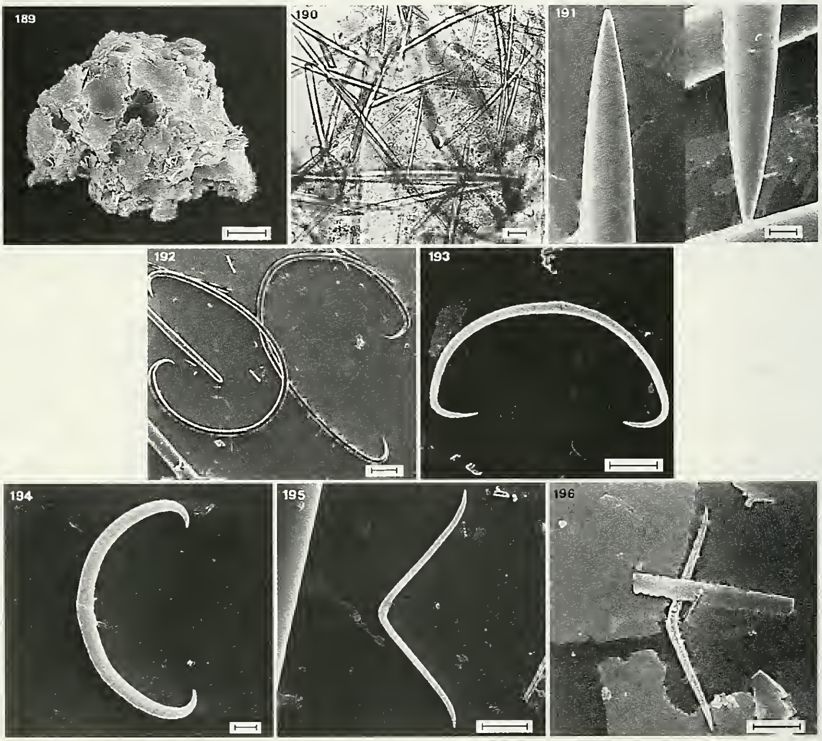
Oceanapia microtoxa n. sp. (Figs 189-196)

Material studied: Holotype USNM 39740 SEPBOP "Anton Bruun", stat. 18B-791C, off Seymour Isl., N coast Indefatigable Isl., 00°26'S 90°20'W, 21-09-1966, 95 m. Microscopical slides and fragments ZMA POR. 11253, MHNG 21052.

Paratype: ZMA POR. 11254 SEPBOP "Anton Bruun", Stat. 18B-795, E of Albemarle Isl., 00°37'S 90°51'W, 24-09-1966, 78 m, rock dredge. Microscopical slides and fragments, MHNG 20770.

DESCRIPTION:

Two big irregular cushion-shaped or turnip-shaped specimens of 110 x 70 x 70 mm and 90 x 90 x 60 mm, with smooth detachable surface crust. The upper surface



FIGS 189-196

Oceanapia microtoxa n. sp. stat 18B-791C off Seymour and Indefatigable Is. 189. Holotype, an irregular cushion shaped specimen, with oscular chimneys. 190. View of the irregular isotropic choanosomal network. 191. Long and straight oxea. 192. Sigma 1 with strongly recurved apices. 193, 194. Sigmas 2, 3 with C form, largely open and stronger than the other categories. 195, 196. Toxas, sharply angled and in two categories. Scales: fig. 189 = 10 mm; figs 190 = 50 µm; figs 191, 193, 195 = 10 µm; fig. 192 = 20 µm; figs 194, 196 = 2 µm.

has 3-10 raised oscular chimneys of unequal height, diameter 6-10 mm, with thin-walled frayed walls, presumably the remnants of low finger-like fistules, but these were not preserved.

Consistency: firm, friable. The interior is very crumbly, full of holes and wider canals. One of the specimens has enclosed and partly overgrown a specimen of *Spongosorites smithae* n. sp.

Colour: light orange-brown in alcohol.

SKELETON:

Ectosomal: an regular tangential unispicular network of intercrossing oxeas. Subdermally there is a loose network of paucispicular tracts (2-3 spicules thick) enclosing angular meshes of 300-500 µm in diameter.

Choanosomal skeleton of longitudinal multispicular tracts (10 or more spicules thick) following irregular courses. In between, single spicules form an irrregular isotropic network. Spongin scarce.

Spicules: Oxeas, sigmas and toxas.

MEGASCLERES:

Oxeas long and straight, with rather abrupt points, 279-*407*-549 by 8-*14*-16 µm.

MICROSCLERES:

Sigmas angulated, thin, three size categories: sigma 1, strongly recurved apices, 70-*96*-122 µm; sigma 2, C form, 32-*44*-61 µm; and sigma 3, C form and more open and stronger than the other categories, 11-*19*-29 µm.

Toxas sharp-angled with recurved apices, in two size categories, toxa 1:45-*52*-70 µm, very numerous; and toxa 2: 6-10 µm; very difficult to detect.

Etymology: the name refers to the very small toxa 2 microscleres.

Remarks: Although the fistules were not preserved, the damaged oscule walls and the typically *Oceanapia*-like skeletal structure make its membership of this genus probably. The spicules are those of the genus *Biminia*, which is now generally considered a junior synonym of *Oceanapia*. We do not think that the possession of sigmas and/or toxas is a character of a monophyletic group within the Phloeodictyidae, as there occur in all combinations in otherwise closely related species.

Other records of *Oceanapia*'s from this area are *Oceanapia bacillifera* Wilson, 1904 (Galápagos), *Rhizochalina pacifica* Dickinson, 1945 (California) and *Rhizochalina oleracea* Schmidt,1870 sensu SIM & BAKUS 1986 (California). None of these have microscleres. *O. bacillifera* has strongyles as megascleres and considerable spongin binding them together. SIM & BAKUS' record is a species with very small oxeas (only 70-110 µm), certainly not conspecific with the Caribbean *O. oleracea* requiring a new name. DICKINSON's species has oxeas of 1300 µm length and is very probably a Halichondrid or Axinellid.

Order DICTYOCERATIDA

Irciniidae Gray, 1867

Genus **Ircinia** Nardo, 1833

Type species: *Spongia fasciculata* Pallas, 1766 by subsequent designation (DE LAUBENFELS 1948).

Definition (emended from BERGQUIST 1980): Irciniidae with prominent surface conules, consistency tough. Primary fibres cored, and in complex fascicles. Secondary fibres simple. Mesohyl with collagenous filaments with terminal knobs.

Ircinia spec. (Figs 197-199)

Material studied: Indefatigable Isl., coll. R. Rofen, 17-05-1966, 0.40-0.60 m. Microscopical slides and fragments ZMA POR. 11255, MHNG 21036.

DESCRIPTION:

Two small fragments of less than 10 mm^3 each of an encrusting sponge. Surface finely conulose. No apparent oscules. Consistency: tough .

Colour: greyish brown in alcohol.

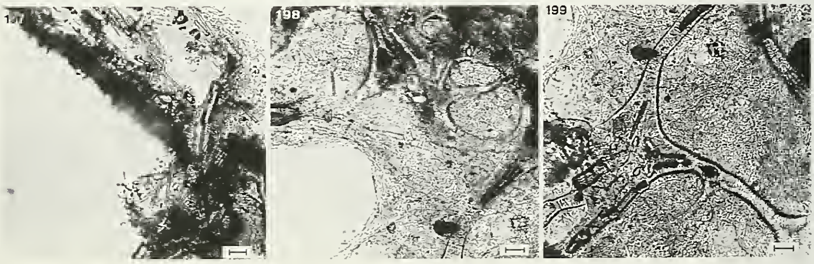
SKELETON:

Ectosome skeleton: a crust of sandgrains and spicule fragment coat.

Choanosome: an irregular system of fasciculate primary fibres of 120-140 µm, sparingly connected by secondary fibres of 40-60 µm. Both types of fibres have a similar central core of spicule fragments. Meshes 400-500 µm in size. The mesohyl is densely filled with a tight mass of thin filaments 1-3 µm in diameter, with terminal knobs of 4 µm.

Ecology: shallow water.

Remarks: in view of the scarcity and fragmentation of available material it is refrained from naming it. There are several reports of *Ircinia* species from the Eastern Pacific: *Ircinia clavata* Thiele, 1905, *Ircinia variabilis hirsuta* Thiele, 1905, *Ircinia "variabilis"* sensu DESQUEYROUX 1972, and *Ircinia fusca* sensu DICKINSON 1945. The



FIGS 197, 199

Ircinia sp. Indefatigable Isl. stat 26. 197. Cross view of surface skeleton. 198, 199. Choanosomal skeleton, fasciculate primary and secondary fibres with central core of spicule fragments. Scales: figs 197-199 = 50 µm.

present specimens differ from these in the possession of much thinner filaments. It is intermediate between *Ircinia* s.s. (thick filaments, fibres cored) and *Sarcotragus* (thin filaments, fibres uncored).

Genus **Cacospongia** Schmidt, 1862

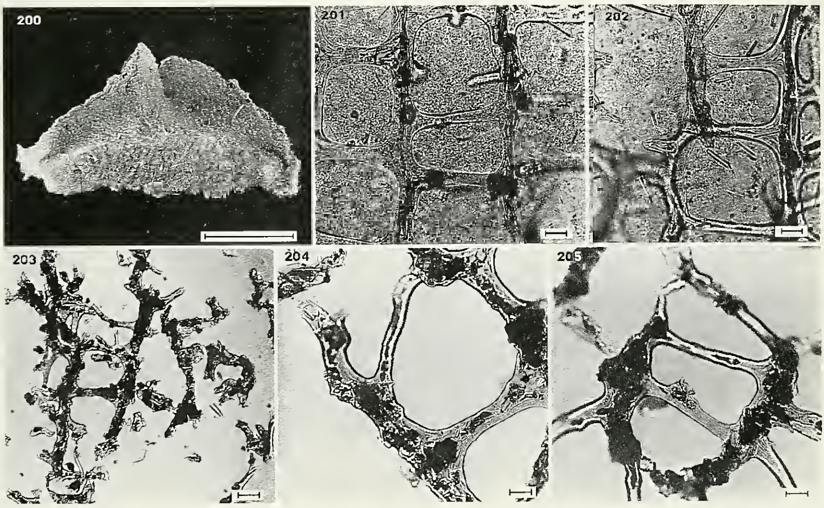
Type species: *Cacospongia mollior* Schmidt, 1862 by subsequent designation (De Laubenfels 1936).

Definition (emended from Bergquist 1980): Surface finely and evenly conulose, resembling *Spongia*. Primary fibres simple, stratified and cored with detritus that can almost obscure the stratified nature of the spongin. Secondary fibres clear, regularly spaced forming an almost rectangular reticulation, with or without pith.

Cacospongia similis Thiele, 1905 (Figs 200-205)

Cacospongia similis Thiele, 1905: 481, fig. 108

Material: USNM 43174 Indefatigable Isl., approximately 5 miles west of Academy Bay, outer reef next to Turtle Bay, coll. R. Rofen, 17-05-1966, at low tide, on volcanic rocks, microscopical slides and fragments, ZMA POR. 11256, MHNG 21039; SEPBOP "Anton Bruun" stat. 16 HA106, N coast Indefatigable Isl., 00°26'S 090°17'W, 15-05-1966, 0-5 m depth, microscopical slides and fragments ZMA POR. 11258, MHNG 21037; stat. 16 66110, S coast Indefatigable Isl., 00°44'S 090°17' W, 19-05-1966, 0-5 m, microscopical slides and fragments ZMA POR. 11257, MHNG 21038.



Figs 200-205

Cacospongia similis Thiele, 1905. 200. Specimen from Turtle Bay, Indefatigable Isl. 201, 202. Choanosomal skeleton, regular network of lightly cored primary fibres and uncored secondary fibres. 203-205, Holotype, ZMB 336, from Calbuco, Chile, choanosomal skeleton. Scales: fig. 200 = 10 mm; figs 201-205 = 50 μm.

DESCRIPTION:

Flattened encrusting cushions, fragmented, 1-1.5 cm thick, with indefinite lateral expansion, but largest fragment 4.5 x 2.5 cm. Surface: only slightly conulose, undulating. Oscules small, less than 1 mm in diameter.

Consistency: spongy but rather stiff.

Colour (in alcohol) purplish brown on top, light beige on the sides; some fragments are entirely beige.

SKELETON:

Ectosomal: organic, very slightly charged with broken spicules and other small foreign particles. Conules are formed by the ends of the primary fibres protruding slightly beyond the ectosome.

Choanosomal: a very regular ladder-like system of lightly cored primary fibres, 41-*50*-70 µm in diameter, and uncored secondary fibres of 30-*34*-40 µm in diameter; here and there tertiary fibres of 8-*19*-25 µm occur. All fibres are finely but distinctly striated and spongin is clear and lightly coloured. Meshes are rectangular 90-*200*-490 by x 66-*250*-353 µm.

Distribution: ?Juan-Fernandez Archipelago, Galápagos Islands.

Remarks: Thiele's species : ZMB 3336 holotype of *Cacospongia similis* from Chile, is the only *Cacospongia* sp. reported from the SE Pacific, but there are a few discrepancies with his specimen which make the present assignment uncertain: he reports primary fibres of 70-90 µm (our measurements: 41-*90*-148) and meshes of 300-500 µm (our measurements: 164-*235*-320), clearly exceeding the measurements of our specimens. On the other hand, variability is unknown and there are certainly similarities.

A species that needs comparison with the present material is DE LAUBENFELS (1932) *Spongia idia* from California (assigned to *Leiosella* by AUSTIN 1985). This has similar rectangular fibre reticulation, but its primary fibres are fasciculate and diameter of the individual fibres may reach 200 µm; it is likely that this is a closely related, but separate species of *Cacospongia*.

Cacospongia incognita n. sp. (Figs 206-209)

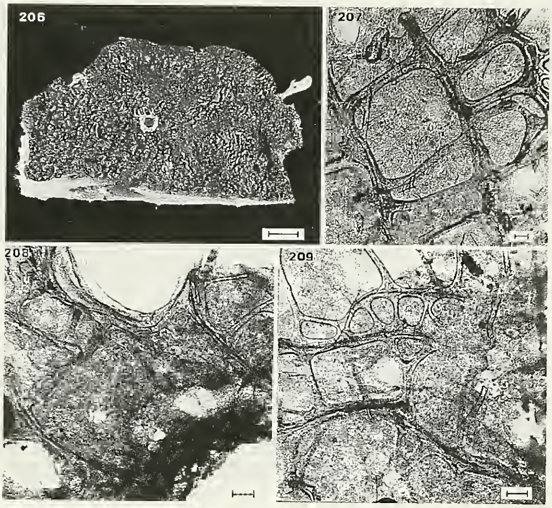
Material: Holotype USNM 40621 Nameless Isl., stat. 26, 22-02-1978, 30 m, rocks, coll. W.D. Hope. Microscopical slides and fragments ZMA POR. 11259, MHNG 21040.

DESCRIPTION:

Large cake-shaped mass, 100 x 62 x 50 mm, (length, large and high) with a finely but irregularly conulose surface. Oscules irregularly distributed, sunken into the sponge, but occasionally slightly elevated on low mounds, 2-5 mm in diameter. A larger hole appears to be occupied (and presumably excavated) by a small crab and a serpulid. Several barnacles encrust the upper surface.

Consistency: firm, compressible, tough.

Colour: upper surface black (both alive and in alcohol), the sides light brown; the interior are a creamy white in alcohol.



FIGS 206-209

Cacospongia incognita n. sp. Nameless Isl., stat. 26. 206. Fragment of the holotype. 207. Choanosomal regular network of spongin fibres, lightly cored by foreing spicules. 208. Upper surface (black region) 209. Subectosomal part, pierced by spaced ostia. Scales: fig. 206 = 10 mm; figs 207-209 = 50 µm.

SKELETON:

Ectosomal: thick organic membrane, heavily pigmented pierced by regularly spaced ostia, 40-50 µm in diameter.

Choanosomal: a regular ladder-like system of spongin fibres. Primary fibres slightly thicker than secondary fibres, distinctly laminated and lightly cored by foreign spicules, probably also by cells, because frequently part of the core appears black in transmitted light over some distance.

Occasionally two primary fibres lie close together and are interlinked by very short secondary fibres, but such fascicles rarely extend over the whole length of the primary fibre. Thickness 120-150 µm. Secondary fibres distinctly laminated, uncored, and connecting to the primary fibres mostly at right angles. Not infrequently they are more irregular and follow an erratic course. Thickness 50-100 µm. Meshes of the skeleton 100-600 by 60-200 µm. Choanocyte chambers rounded oval, 30-40 µm in diameter.

Etymology: the name refers to its appearance.

Remarks: the new species was first tentatively assigned to *Smenospongia* on account of its robust fibres, black exterior combined with a light interior, and occasional organic coring material. The specimen shows some similarity with Caribbean *Smenospongia cerebriformis* (Duchassaing & Michelotti, 1864).

However, BERGQUIST (1980) defined *Smenospongia* as having uncored primary fibres. The genus *Cacospongia* has cored primary fibres and a rectangular skeleton, and thus fits the present species perfectly. It differs from the above *Cacospongia similis* clearly in the coarser fibres and meshes; the present species likewise needs to be compared with Californian *Cacospongia idia* (De Laubenfels).

Order DENDROCERATIDA

Dysideidae Gray, 1867

Genus **Spongionella** Bowerbank, 1862

Type species: *Spongionella pulchella* Sowerby, 1806 by monotypy.

Definition (from BERGQUIST 1980): Dysideidae with skeletal compact reticulation of uncored primary and secondary fibres in which concentric laminations and a pith component are always apparent though variable in extent. Skeletal arrangement regular. Primary fibres are extended into fine tapered projections and surface is finely conulose.

Spongionella repens (Thiele, 1905) (Figs 210-211)

Spongelia repens Thiele, 1905: 486, fig. 111.

Material studied: SEPBOP "Anton Bruun" 18B-795, E of Albemarle Isl., 00°37'S 90°51'W, 1966, 78 m, encrusting on shells. Microscopical slides and fragments ZMA POR. 11260, MHNG 21041.

DESCRIPTION:

Semiglobular cushion on a fragment of a *Pecten* shell. Size 20 x 15 x 10 mm.
Surface: hispid, conulose, somewhat macerated. No apparent oscules.
Consistency: softly, spongy.
Colour: greyish beige in alcohol.

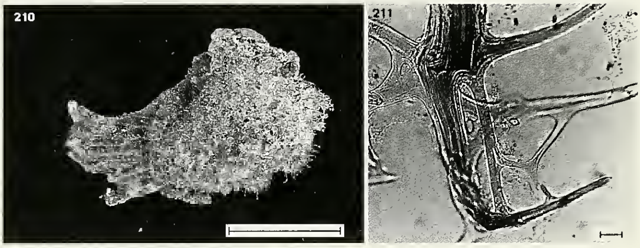
SKELETON:

Ectosomal: Absent.

Choanosomal: fibres laminated, amber-coloured, some of them filled with detritus. Primary fibres of 37-*68*-110 µm in diameter lie at distances of 98-*600*-1150 µm. In between and interconnecting the primary fibres is an irregular system of secondary fibres, 8-*22*-31 µm in diameter and tertiary fibres of clear spongin, 8-*12*-16 µm in diameter enclosing irregularly shaped and arranged meshes of 90 - 369 by 66 - 400 µm.

Distribution: ?Juan Fernandez, Galápagos Islands.

Remarks: the assignment of this material to Thiele's species is made somewhat hesitatingly because of the distance of the primary fibres (300 µm in Thiele's specimen) and the geographic separation (Juan Fernandez is in a distinctly colder region). Several details do match, including the habit and the size and arrangement of the secondary and tertiary fibres. It is assumed that primary fibre distance is variable.



FIGS 210-211

Spongionella repens (Thiele). Stat. 18B-795 E. of Albemarle Isl. 210. Semiglobular cushion on a *Pecten* shell. 211. Laminated amber colour primary and irregular network of secondary fibres. Scales: fig. 210 = 50 mm; fig. 211= 50 μm.

Order VERONGIDA

Aplysinidae Carter, 1875

Genus **Aplysina** Nardo, 1834

Type species: *Aplysina aerophoba* Schmidt, 1862 by subsequent designation (DE LAUBENFELS 1948).

Definition (from BERGQUIST 1980): marked aerophobic colour change from yellow or green to darker colours; with fibres of only one kind without foreign material and with a thick pith. Fibres form a regular reticulation with large hexagonal meshes. Without specialized surface arrangement.

Aplysina azteca Gómez & Bakus, 1992 (Figs 212-215)

Aplysina aztecus Gomez & Bakus, 1992: 179, pl. 3, 4.

Material studied: ZMA POR. 11263 Indefatigable Isl., 0.6-0.9 m, 17-05-1966, coll. R. Rofen.

DESCRIPTION:

Two fragments in the form of low cushions, 1 x 1 x 0.5 cm each; no oscules or other apertures.

Surface: rough, faintly conulose.

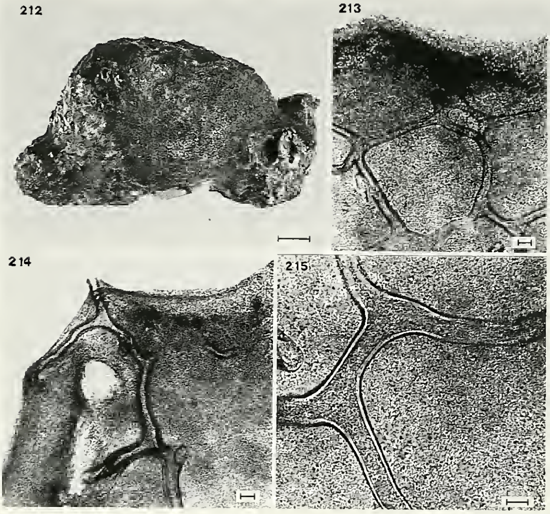
Colour: black outside, grey interiorly.

Consistency: firm.

SKELETON:

Ectosomal: organic, easily detachable, with a strong dark pigmentation.

Choanosomal: with a regular reticulation of only one category of fibre; without difference in diameter, between primary and secondary fibres, 41-*82*-164 μm. All fibres with a thick pith, 49-60 μm. A regular reticulation with large hexagonal meshes, 560-2000 μm. is clearly visible, distance between fibres, 410-*597*-820 μm.



FIGS 212-215

Aplysina azteca Gómez & Bakus. Stat. 16-6670 02°11'S 80°56'W. 212. Terminal part of the Galápagos specimen. 213. Choanosomal skeleton with strong dark pigmentation of the surface. 214. Undifferentiated pithed fibres, without foreign material. 215. Dark pigment, internal spaces. Scales: fig. 212 = 10 mm; figs 213-215 = 50 μm.

Distribution: Galápagos Islands; Baja California.

Remarks: our fragments resemble *A. azteca* from Baja California in its typically globose form and sizes of meshes of the fibre system.

BIOGEOGRAPHY

Table 11 summarizes the known distributions of the some 70 species recorded from the Galápagos Islands. More than half of the species are endemic (37 spp. = 56.1 %) , of which 23 (= 34.8 % of the total of species studied) are new. Of the remainder, 13 species are also represented in the South East Pacific coast (California, Peru, Mexico and/or Chile). Among them *Cliona chilensis* is unusual for its wide distribution along the East Pacific coast, from California to Chiloé at 42°S. The absence of the species South of Chiloé supports the conclusion of the existence of two areas of endemism along the Chilean coast (DESQUEYROUX-FAÚNDEZ & VAN SOEST 1996): A Northern one extending from California to Chiloé (42°S) and a Southern one, the Magellan region (43°-53°S). Two Galápagos species occur only in the Pacific coast of Mexico and Panama one of which is amphiamerican in distribution (present in Porto Rico, the Bahamas and Brazil). Finally, two species share a Caribbean distribution and three species are "cosmopolitan".

Table 11

Known distribution of species recorded at Galápagos islands, e = endemic; + = if represented in an additional area. Last column indicates tentative grouping of closest related species.

	Galápagos	E Pacific	Central Pacific	Other	Affinities
P. fragilis n.sp.	e	-	-		cosmotropical
P. microlobata n.sp.	e	-	-		amphi-american
P. pacifica n.sp.	e	-	-		cosmotrop/Antarc.
P. galapagensis n.sp.	e	-	-		cosmotropical
P. foliaformis	e	-	-		
P. saccharis	+	+	-		NE Pacific
P. apicospinatus n.sp.	e	-	-		?Indo-West Pacific
P. scabiosus n.sp.	e	-	-		?
S. eduardoi n.sp.	e	-	-		NE Pacific
D. reptans n.sp.	e	-	-		cosmotropical
P. cribraria	e	-	-		?cosmopolitan
V. tricornis	e	-	-		?cosmopolitan
G. media	+	Mexico Panama	-		amphi-american
G. paupera	+	-	-	British Is.	?
T. fenestrata	e	-	-		Arctic
T. echinata	e	-	-		Arctic
T. lamelliformis	e	-	-		Arctic
T. pyriformis	e	-	-		Arctic
E. cf. *oxyaster*	e	-	-		Indo-West Pacific
C. isabela n.sp.	e	-	-		NE Pacific
C. globulosa n.sp.	e	-	-		amphi-american
C. chilensis	+	+	-		N+S E Pacific
C. verrucosa n.sp.	e	-	-		cosmotropical
C. cf. *chucalla*	+	-	Hawaii	Australia	Indo-West Pacific
S. hospitalis n.sp.	e	-	-		Indo-West Pacific
P. maeandria	e	-	-		NE Pacific
P. villosa n.sp.	e	-	-		Antarctic
Q. translucida n.sp.	e	-	-		Arctic
T. sarai n.sp.	e	-	-		cosmotropical
A. dendrophora	e	-	-		amphi-american
P. hooperi n.sp.	e	-	-		amphi-american
P. lamelligera	e	-	-		amphi-american
H. diazae n.sp.	e	-	-		NE Pacific-Arctic
H. papillosa	+	+	-		SE Pacific
H. sinapium	+	-	-		NE Pacific
S. smithae n.sp.	e	-	-		amphi-american
T. aff. *ophiraphidites*	+	-	- -	Porto Rico Caribbean	amphi-american
I. lamella	+	+	-		NE Pacific
l. lamella-indivisa	e	-			NE Pacific
l. chelifer	+	-	-		Antarctic
l. chelifer ostiamagna	+	-	-	C. Good Hope	Antarctic
A. peruanus	+	+	-		Indo-West Pacific
A. (P.) lithophoenix	+	+	-		NE Pacific-Arctic
A. galapagensis n.sp.	e	-	-		NE Pacific

M. mexicensis	+	+	-		Arctic
T. galapagensis	e	-	-		cosmotropical
T. nigrescens	+	Mexico	-	Cospopolitan	cosmotropical
		C. America	-		
P. californiana	+	+	-		Arctic
M. roosvelti	+	-	-		amphi-american?
L. albemarlensis n.sp.	e	-	-		cosmotropical
G. abbotti	+	+	-		NE Pacific
M. (C.) cecilia	+	Mexico	+		amphi-american
		Panama	-		
H. enamela	+	California	-		NE Pacific
		Mexico	-		
H. permollis	+	Panama	-		NE Pacific
P. variabilis	+	-	Philippines	Antarctic	?
				Australia	
P. similis densissima	+	Chile	Philippines	Falkland	?
				Kerguelen	
				C. Good Hope	
O. microtoxa n.sp.	e	-	-		cosmotropical
O. bacillifera	+	-	-	Off Bahia	?
A. simulans	+	-	-	Cosmopolitan	NE Pacific
?*C. vaginalis*	+	-	-	Caribbean	amphi-american
I. spec.	e	-	-		?
C. similis	+	+	-		SE Pacific
C. incognita n.sp.	e	-	-		?SE Pacific
S. repens	+	+	-		Arctic
A. azteca	+	+	-		amphi-american
A. ecuatorensis n.sp.	e	-	-		amphi-american

Total: 66
Endemics: 37
new species: 23

Five genera are recorded for the first time from the East Pacific region: *Sigmosceptrella*, *Quasillina*, *Phakellia*, *Halicnemia* and *Spongosorites*.

Distributional data confirm our previous conclusion (Desqueyroux-Faúndez & van Soest 1996), to assign the Galápagos fauna and that of the tropical and temperate American coast to the same area of endemism.

Quite a different pattern emerges when analysing the distributions of pairs of closest related species or groups of species (last column in table 11). The groupings used here are tentative and should be tested with rigid cladistic methodology. Whereas at species distribution level the major affinities are to the tropical and temperate East Pacific coast, in the broader species group approach we find most affinities with the Pacific North temperate and Arctic coasts indicating a possible non-Tethyan origin of this fauna. At this state of our knowledge it is difficult to explain the differences. In the former approach the result may be biased due to the large amount of non informative endemic species. In addition, the former approach may be useful for defining areas of endemism but cannot be used for analysing historical relationships between areas of endemism.

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